N. Murray

OCEANSIDE WATER POLLUTION CONTROL PLANT
ADVANCED FACILITIES PLANNING
TECHNICAL MEMORANDUM

SUBJECT: **Westside Operation Plan for the Oceanside Water Pollution Control Plant**

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INTRODUCTION

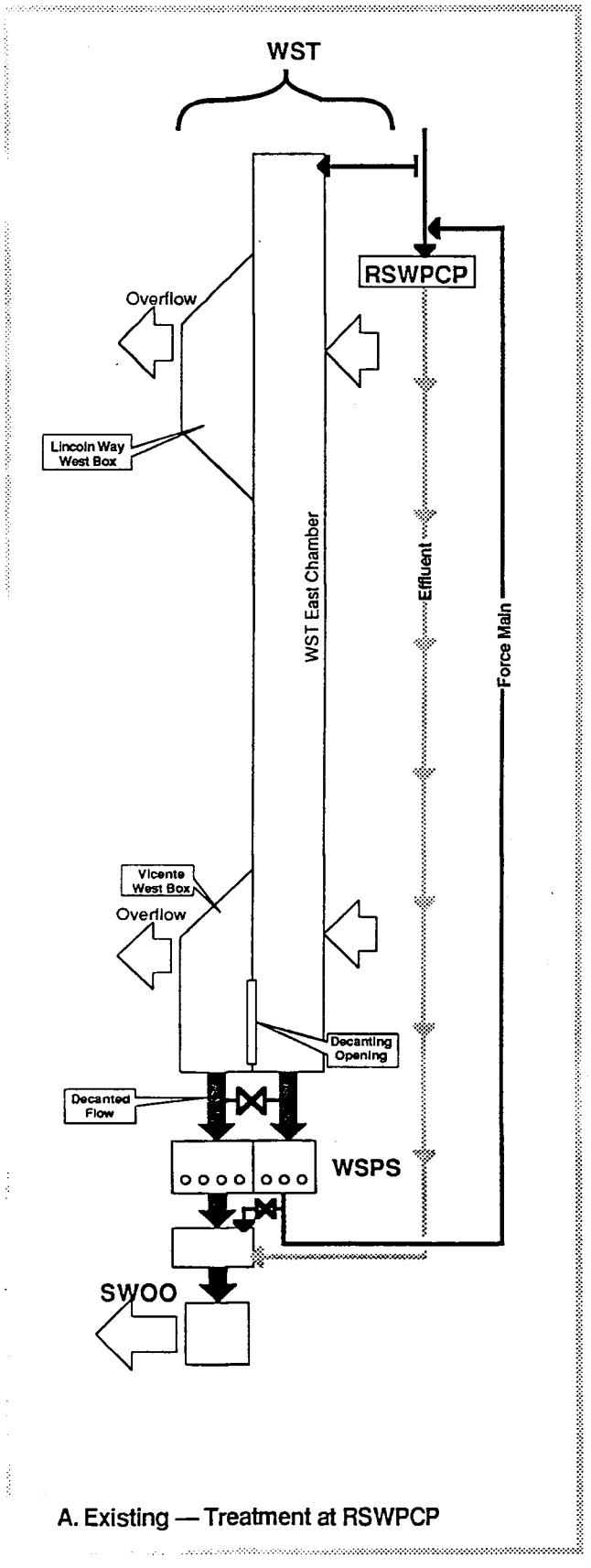
In the future, the Westside Pump Station (WSS) will pump dry and wet weather flows from the west side of San Francisco to the Oceanside Water Pollution Control Plant (OWPCP) and pump decanted wet weather flow to the Southwest Ocean Outfall (SWOO). The Westside Pump Station (WSS) is presently pumping decanted wet weather flow to the SWOO and pumping stored wet weather sewage back to the Richmond-Sunset Water Pollution Control Plant (RSWPCP) for treatment. These, as well as the existing Westside Transport (WST), the future Lake Merced Transport (LMT) and the proposed Richmond Transport, are the major elements of the Westside Core System. With the construction of the new Westside treatment plant, the OWPCP, to be completed by August 1993, the RSWPCP will be phased out and the Westside Core System modified to accomodate these changes. This report explains the necessary physical and operational modifications to the Westside Core System.

SUMMARY

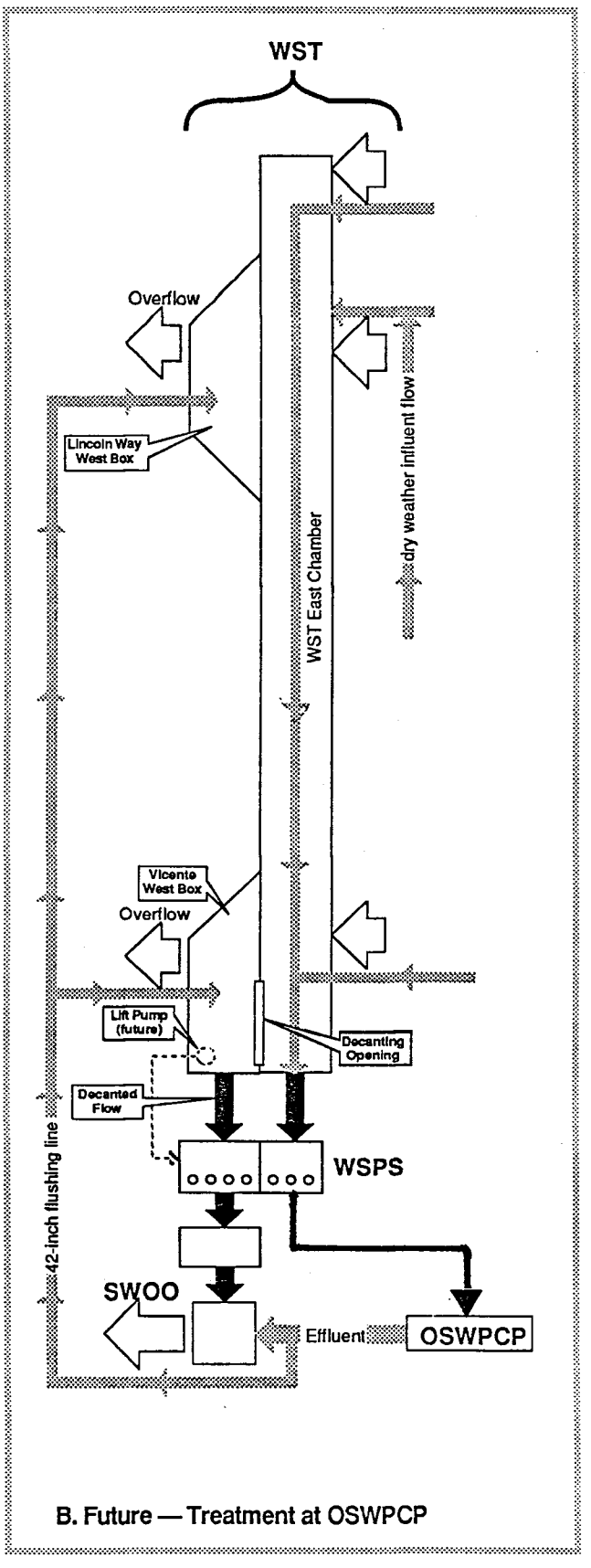
A. PROPOSED SYSTEM DESCRIPTION

With the construction of the new OWPCP and the demolition of the RSWPCP, the Westside Core System will undergo a number of improvements and modifications. The present system provides for dry and wet weather flow treatment at the RSWPCP. The WST transports raw sewage to the pump station and stores excess wet weather flow until it can be treated. When its storage capacity is exceeded, the WST overflows decanted sewage into the Pacific Ocean at two overflow structures. The WSS pumps decanted wet weather flow out the SWOO and pumps stored wet weather sewage back to the RSWPCP for treatment.

After completion of the OWPCP, Westside flows will be rerouted from the RSWPCP to the OWPCP. Dry weather influent from the Richmond District will enter the WST at Fulton Street and travel by the cunnette to the WSS. Sewer modifications will be made along Fulton Street to abandon the Fulton Street Pump Station and divert dry weather flows directly into the WST. The existing sewers and diversions structures at Lincoln Way will be altered to allow both dry and wet weather flows to enter the cunnette at Lincoln Way. Sewer lines and catch basins at Vicente and the Lower Great Highway will be modified to divert dry weather flows away from theVicente Pump Station and towards the 84" RCP, allowing the Vicente Pump Station to be abandoned.



A. Existing — Treatment at RSWPCP



B. Future — Treatment at OSWPCP

Schematics of the existing and future Westside Core System

With the construction of the proposed Lake Merced Transport, the Lake Merced Pump Station, which currently pumps up to 6.7 mgd northward into the Vicente watershed, will also be abandoned. The LMT will link flows from the Upper and Lower Lake Merced drainage districts directly to the WSS at Sloat Blvd. via a 13.5 foot diameter tunnel down the center of the Great Highway.

An operating level of 968 to 973, the invert elevation at the end of the east box, is proposed for the WSS wet well. The WSS will be equipped with three additional variable speed drives. This will result in two variable speed pumps in the west chamber and three in the east chamber. The three VFD pumps in the east chamber will pump the dry weather influent flow, via a 48-inch force main to the Pretreatment Building of the Oceanside Plant. The west chamber will be available for emergency back-up, in case of bar rack failure in the east chamber, as well as pumping decant from the west box to the SWOO. Additional modifications to the pump station include replacing the screens in the east chamber so that the spacing is increased to 1 and 1/2 inch, an improved means of screenings handling, and a possible expansion of odor control units to handle dry weather screenings.

Flow rates ranging from 6 to 65 mgd have been anticipated for the OWPCP. This combined with a maximum decant discharge to the SWOO of 88 mgd, willl result in a total wet weather treatment capacity of 153 mgd. The OWPCP will receive the pumped flows in the receiving structure ahead of the three bar screen/grit system influent channels. Flow will gravitate through the treatment processes of the plant to the SWOO junction structure and out the SWOO. The downstream hydraulic control point at the junction structure is elevation 1005.8 which is calculated based on a 10 year high tide and 160 mgd out the SWOO. All elevations are given in relation to 1000 plus City Datum. 0.0 base of the City and County of San Francisco is 11.66 feet above the Presidio Lower Low Water (0.0 USGS) and 8.61 feet above "Sea Level Datum of the First-Order Level Net (NGVD).

B. PROPOSED MODIFICATIONS

1) Westside Pump Station

City's Responsibility

a) Increase bar screen spacing to 1–1/2 inches in the East Chamber.
b) Improve screenings handling. A Screenings grinder is currently being tested.
c) Review existing odor control facilities for suitability in handling the increased capacity in the WSS resulting from both dry and wet weather flows.
d) Order and install three additional Emersen variable frequency drive systems.
e) Develop P&ID's,I/O list, revised Central Graphic Panel Layout drawing and functional and loop descriptions for revised operating modes and additional

equipment for the WSS.

f) Locate and construct a 1" PVC sodium hypochlorite addition point within the WSS to CH2M–Hill's matchline.
g) Investigate the possibility of corrosion of the existing impellors when prechlorination takes place in the WSS upstream of the pumps, and make recommendations for purchasing new impellors, if necessary.
h) Provide opening in the wall for the data highway conduit and cabling from OWPCP.
i) Provide adequate cabinet space for the new DCU within the existing PC Panel.
j) Provide telephone lines within the pump station.
k) Modify the Central Graphic Panel to reflect the revised operating modes.
l) Connect 16" effluent flushing line (to be constructed by CH2MHill) to the existing 42" force main west of Vault No. 2.
m) Design and install spool piece in Vault No. 3 to connect the 48" influent force main (to be constructed by CH2MHill) with the existing 48" pump discharge line.

Consultant's Responsibility

a) Provide data highway cabling and conduits between the WSS and the OWPCP for connection to the new WSS DCU to provide remote control and monitoring of the WSS from the OWPCP.
b) Provide programming for WSS DCU to reflect the revised operating modes
c) Provide DCU installation and testing at WSS, compatible with DCS operation at OWPCP.

2) Westside Transport

City's Reponsibility

a) Conduct field investigation to verify that all side sewer connections to the 2'x3' sewer on Fulton Street from the Great Highway to 48th Avenue have been intercepted.
b) Abandon the 2'x3' sewer and filling the dry weather sump in Diversion Structure No. 1, at Fulton Street and the Great Highway. Rerout dry weather flows into the 69" sewer in order to direct flows to the 90" and the WST.
c) Raise the 12" VCP at 48th Avenue and Fulton, and divert dry weather flows directly to the 63" line at 48th Avenue and Fulton Street
d) Plug the existing 10" RCP which connects the 12' VCP with the 2'x3' sewer at 48th Avenue and Fulton.
e) Abandon and demolish Fulton Pump Station (FPS)
f) Plug 8" VCP to FPS at 48th Avenue and Fulton Street (see figure 11.)
g) At 46th Avenue and Fulton, check the 24" CIP to the RSWPCP for catch basin connections to be rerouted.
h) Extend the 54" RCP (or a smaller size to be determined) along Fulton Street to 41st Avenue

i) Modify Diversion Structure No. 11 at Lincoln Way and 48th Avenue so that dry weather flows are directed into the 60" RCP line to the WST

i) Construct a new line at 48th Avenue and Lincoln Way connecting the 75" line to Diversion Structure No. 11

j) At 46th Avenue and Lincoln Way, modify the existing Diversion Structure to direct flows away from the 30" line to the RSWPCP and reroute them to the 75" line to Diversion Structure No. 11.

k) At Vicente and the Lower Great Highway, reroute the 8" dry weather line to the Vicente Pump Station to direct flows into the WST .

l) Modify the existing 42" force main at Vicente and Judah Streets, so that it can be used as a flushing water return line from the OWPCP, conveying plant effluent to Lincoln Way and Vicente Street for WST flushing. Plans call for a 10" tee and a pneumatic valve to be installed at each location.

m) Install a gate in the west box on the Lincoln Way Overflow Structure

3) OWPCP

Consultant's Responsibility

a) Provide a 48" diameter, 2800-foot long, influent force main from the WSS to the OWPCP, and tie in at the WSS

b) Provide a 16" diameter, 2300-foot long, treated effluent pipeline from the OWPCP to the WSS and 6 mgd effluent pumps; the connection of this pipeline with the existing 42" discharge line from the WSS north of vault no. 2.

c) Provide a 1" PVC sodium hypochlorite pipeline from the OWPCP to the matchline east of the WSS for the prechlorination of influent flow to the OWPCP.

d) Provide DCU compatible remote I/O units and required cabling and conduits (if necessary) for the WST equipment and connection to the WSS Distributed Control Unit to provide the remote control and monitoring of the WST from the OWPCP DCS.

WESTSIDE SYSTEM DESCRIPTION

A. WESTSIDE TRANSPORT (WST)

The WST is an underground concrete structure approximately 12,000 feet in length. It has a variable depth ranging from 15 to 40 feet. The WST structure consists of an east box and two westside boxes at Lincoln Way and Vicente Street (see Figures 4 and 5). The east box, with an internal width of between 17.5 and 25 feet, extends the length of the WST structure from Fulton Street to Sloat Boulevard with a constant slope of 0.002. The two westside boxes, each with an internal width of 25 feet, are attached to the east box in the vicinity of Lincoln Way and Vicente Street.

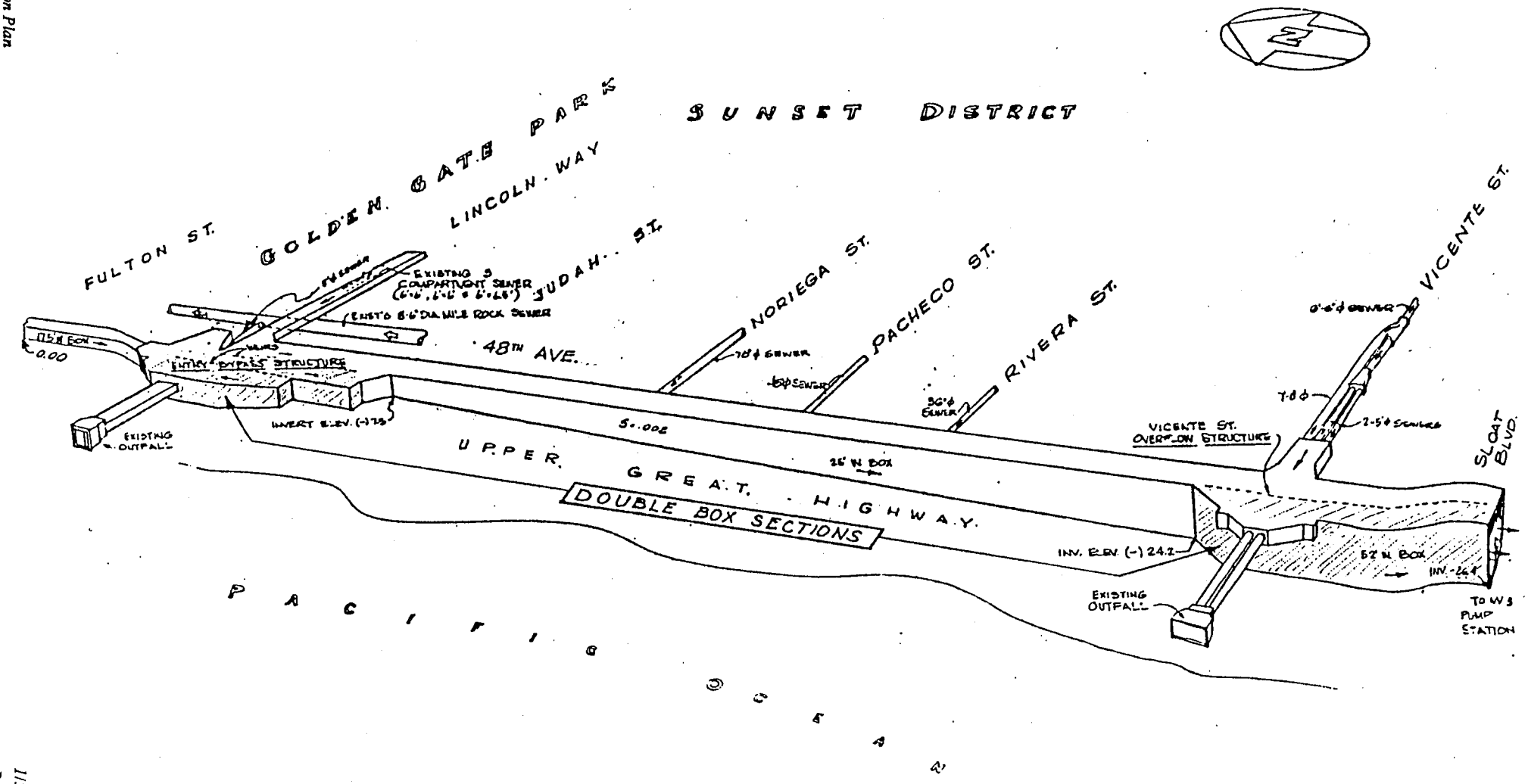


FIGURE 2.
WESTSIDE TRANSPORT PERSPECTIVE

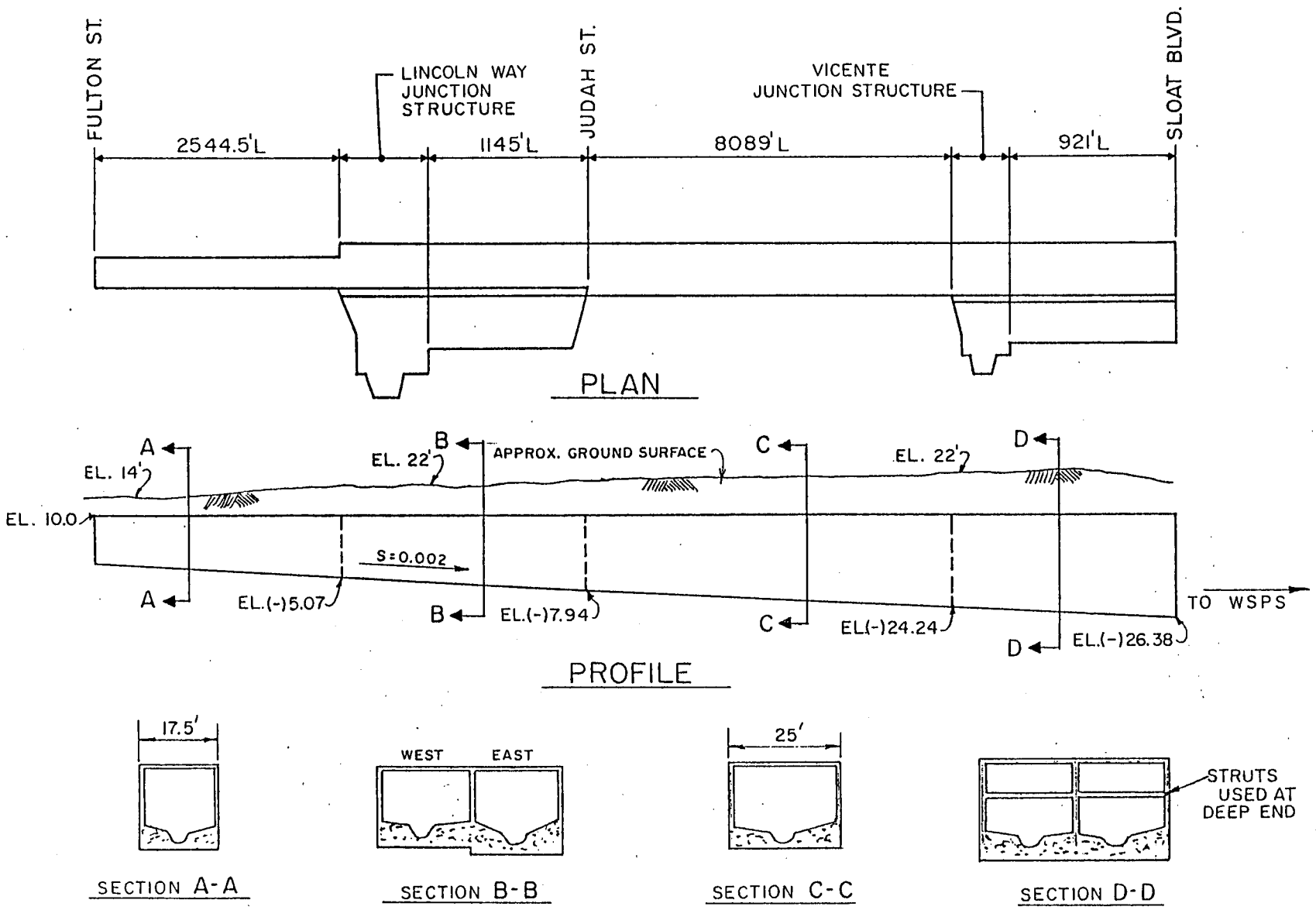


FIGURE 3.
WESTSIDE TRANSPORT-PLAN, PROFILE & SECTIONS

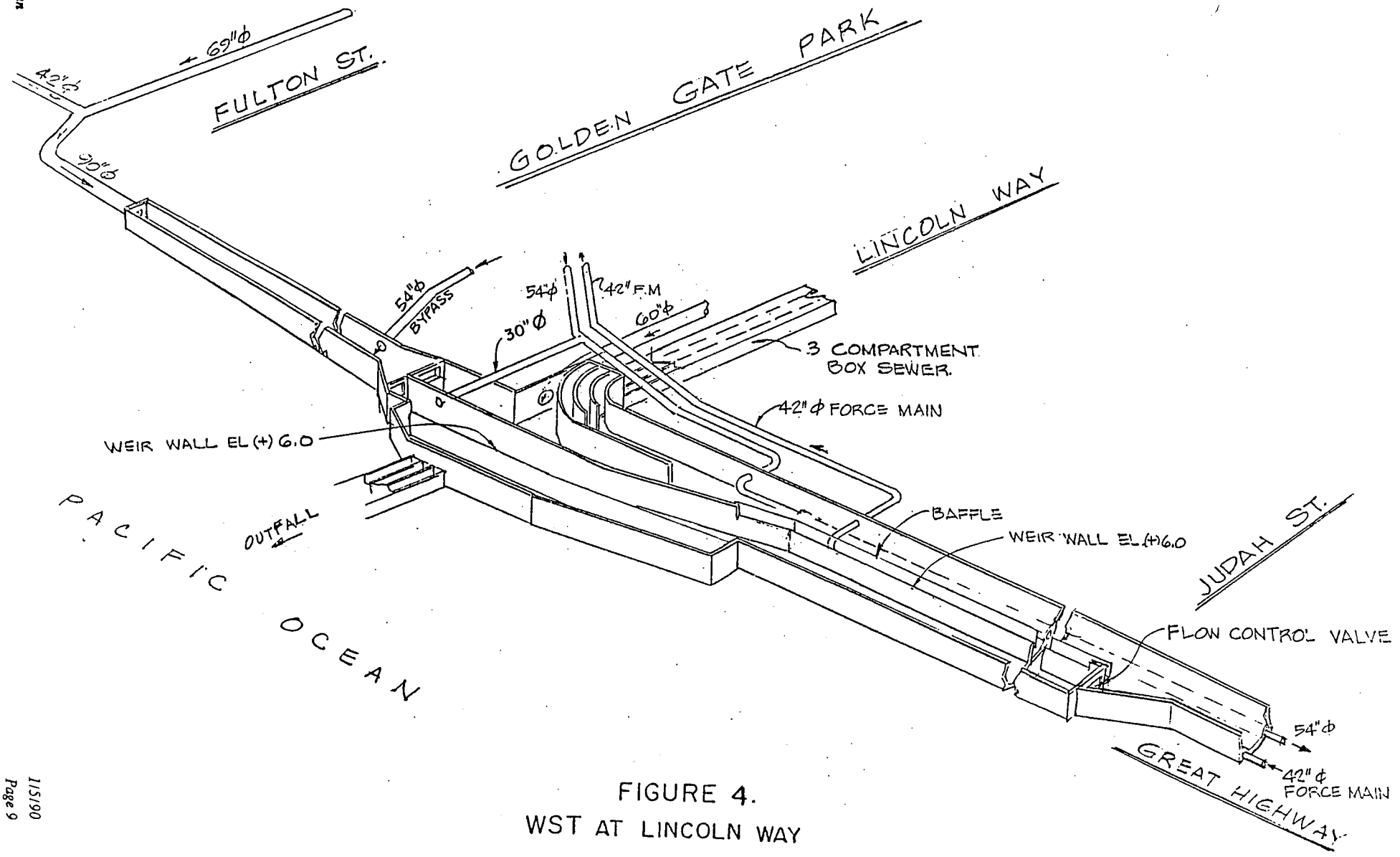


FIGURE 4.
WST AT LINCOLN WAY

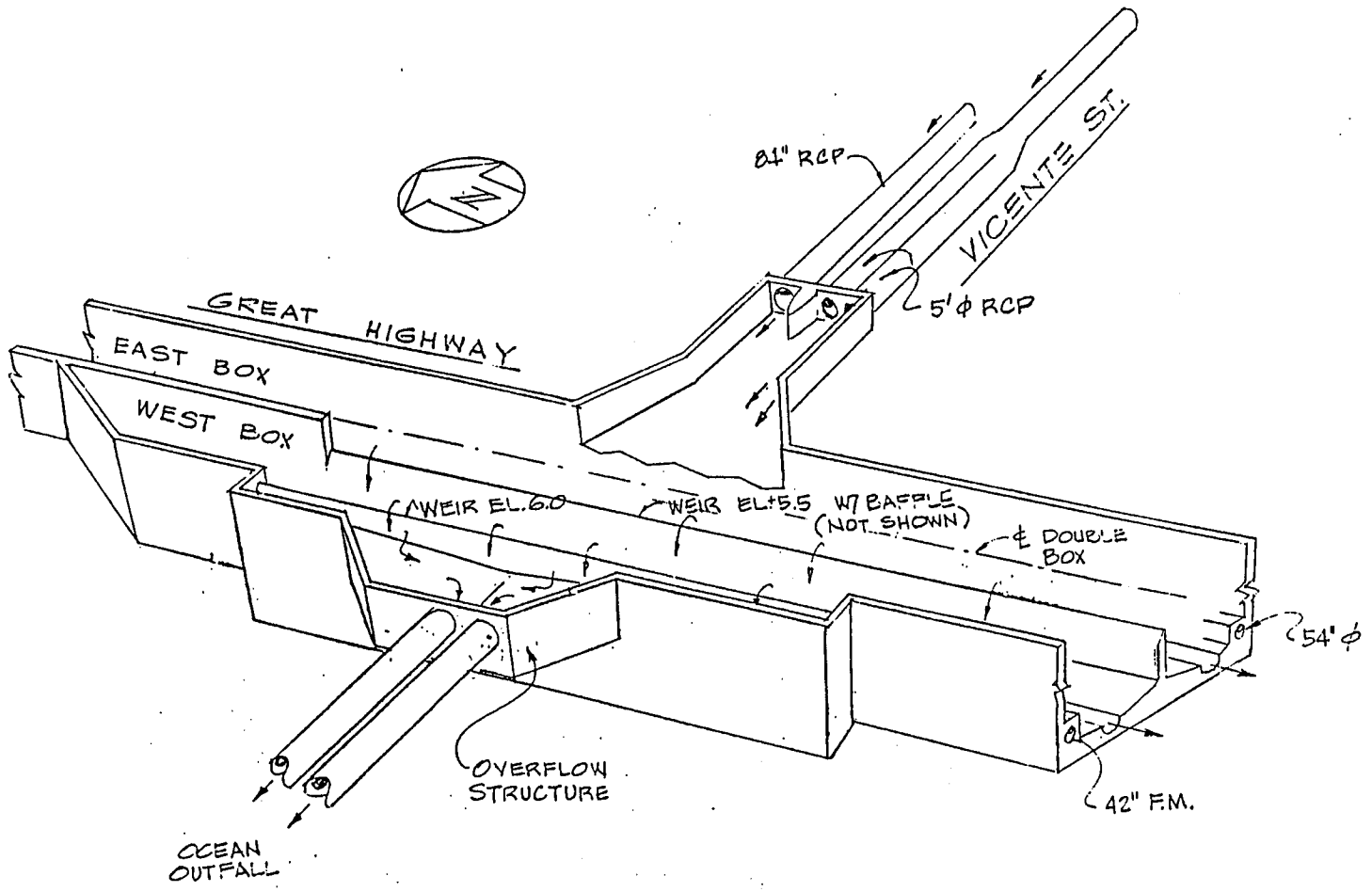


FIGURE 5.
WST AT VICENTE STREET

With the completion of the OWPCP, the WST will provide storage to accomplish the following:

1. Convey dry weather sewage to the WSS for pumping to the OWPCP.
2. Convey decanted wet weather sewage to the WSS for pumping to the SWOO.
3. Maximize the total volume of wastewater treated by both the OWPCP and the WST.
4. Assure that all discharges to the ocean pass through baffled outlet structures.
5. Meet the long-term overflow requirement of eight overflows per year.

The WST system has a total storage capacity of about 49.3 million gallons (MG), distributed among the three WST storage elements as follows:

WST East Chamber	40.4 MG
Lincoln Way West Box	2.2 MG
Vicente West Box	6.7 MG

All the volumes shown above correspond to elevation 1006 feet, San Francisco datum (i.e. the crest elevation of the overflow weirs).

At elevation 990 there are ten 7.5 -foot long by 1-foot high openings on the intermediate wall that separate the WST east chamber from the west box at Sloat Blvd for a total overflow weir length of 75 feet (see Figure 6). These openings are equipped with baffles to keep floating debris in the east chamber while decanting wet weather flows into the west box. In addition, some solids settle out in the east box during the decanting. The decant operation is expected to provide a level of treatment equivalent to primary sedimentation when processing the more dilute wet weather sewage. The storage volume in the east chamber below the decanting opening is approximately 8.2 MG.

With the completion of the OWPCP, dry weather influent will travel through the WST to the WSS to be pumped to the new plant. In order to flush sediment from the floor of the cunnette and control odors within the WST, a means of flushing the Transport will be provided. A 16" effluent flushing line from OWPCP will be connected to the existing 42" line running along the west shelf (see Figure 6.) so that chlorinated plant effluent can be pumped to the Lincoln Way and Vicente West Boxes. Details of this procedure are described in Section 6 of this report, WSS and WST Operation.

Modifications to the WST will include installing tees and valves in the existing 42" force main at Vicente and Judah Streets, so that it can be used as a flushing water return line from OWPCP. In addition, a new gate or valve will be constructed between the east and west boxes at Lincoln Way. The existing valve, 01V11-2, lies at the bottom of the wall separating the east and west boxes, so that its invert is the same as the bottom of the

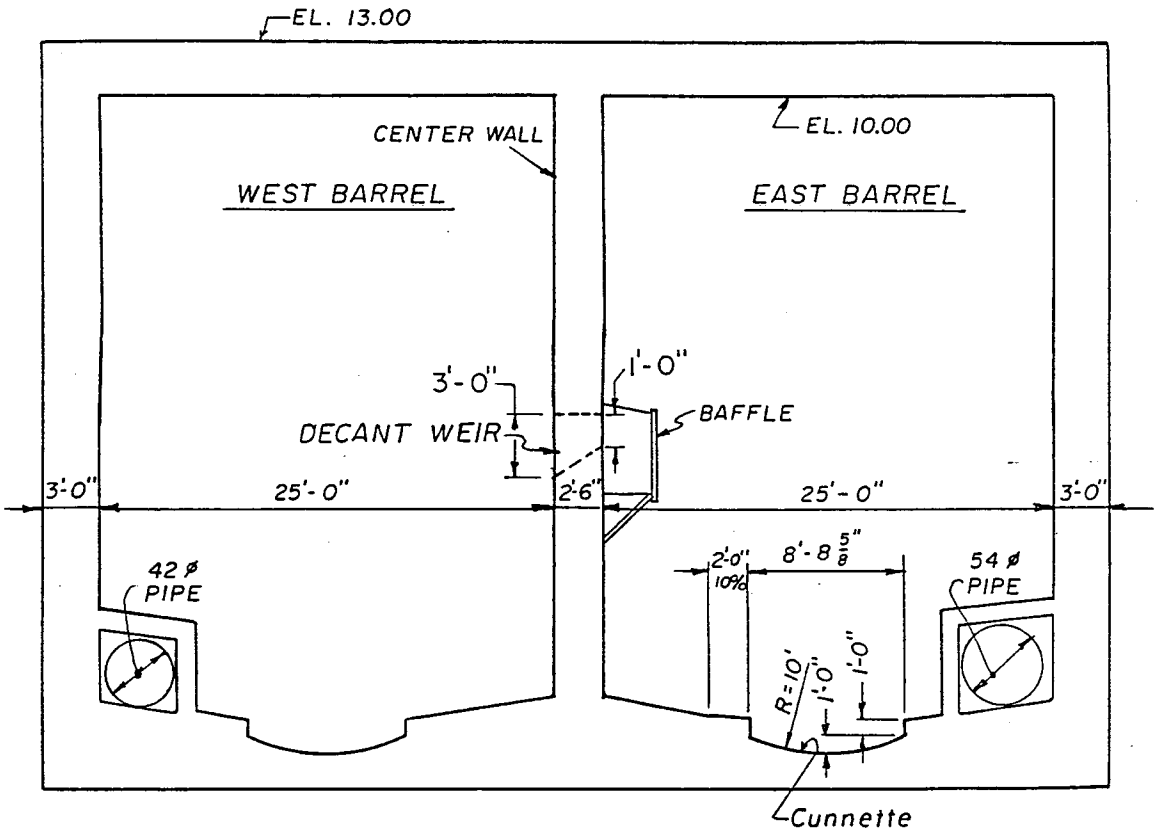


FIGURE 6.

WESTSIDE TRANSPORT CROSS SECTION SHOWING
DECANT WEIR AT SLOAT BLVD

cunnette. When the water level in the west box is higher than that in the east box and the gate is opened, flow will be from the west box into the east box as desired. But when the water level in the west box is lower than that in the east box, the direction of flow will be reversed, and dry weather influent can enter the west box. A number of different solutions are being considered to prevent this from occurring. One possibility is to install a new sluice gate or valve, with an invert above the east cunnette. This would prevent a backwash of dry weather influent into the west box, however, the bottom two feet of the west box would then have no way to drain, and would be lost to storage. The second option is to raise the floor level of the entire Lincoln West Box two feet. The two feet of storage would still be lost, but the entire box would then be able to drain into the east chamber.

In the event of bar rack or pump failure in the east chamber of the WSS, dry weather flow in the east box will be diverted through the crossover gate into the west pump chamber. From the west chamber it will be pumped via the influent force main to the OWPCP. After the use of the west chamber for dry weather or undecanted flow, it should be cleaned before it can be used to discharge to the SWOO. To allow cleaning of the west chamber, chlorinated effluent will be pumped back to the Vicente West Box via the 42" flushing line and discharged through the west box directly into the west chamber. Since there are no provisions for flushing the east box at Vicente at this time, no additional gates or valves in the Vicente east box are required.

B . WESTSIDE PUMP STATION

The Westside Pump station is located on the western edge of the City adjacent to the San Francisco Zoo. The pump station, constructed of reinforced concrete, is divided by concrete walls into a floodable section and a non-floodable section. The floodable section contains the inlet channels, the main pump sumps, the dewatering room, and the main pump discharge manifold room. The non-floodable section houses fans, switchgear, controls, water pumps, and other equipment vulnerable to damage if submerged.

The station has two inlet channels, each leading to a pump chamber. The channels are equipped with mechanically cleaned catenary bar racks with 3/4 inch openings. Access to the channels and pump chambers, which are 50 feet below grade, is by watertight doors at the channel level. The station uses seven Flygt Model CP 3530 pumps that are identical except for impeller size. The east chamber, pump chamber number 1, contains three 540 mm impeller pumps, one of which is a variable speed pump. The west chamber, pump chamber number 2, has three 450 mm impeller pumps which are constant speed pumps, and one 540 mm impeller variable speed pump.

Two variable frequency drives (VFDs) are necessary to provide a smooth transition over the full range of expected dry and wet weather flows. Additionally, in order to meet the reliability redundancy criteria, the west pumps must also be able to pump dry weather flow. Modifications for pumping to the OWPCP require an additional two variable speed drives in the east chamber and one in the west chamber. This will result in two variable speed pumps in the west chamber and three in the east chamber. The VFDs are expected to control the pump flows without the need of the discharge flow control valve. The pump control valve will only be needed during storms to keep the pump on its curve at high sump levels. (See Appendix E: Valve Throttling - Main Lift Pumps).

A programmable logic controller (PLC) located in the control room above grade currently provides control of the complete station. In the Automatic control mode, the WSS PLC and the Supervisory Control Unit (ModVue) at RSWPC control the station. Locally a central man-machine interface is provided by the Graphical Control Panel located in the station's control room.. The Graphic Control Panel will be modified and the programmable controller replaced with a Distributed Control Unit as part of the conversion to OWPCP operation. These modifications are discussed in detail in Section 6 of this report, WSS and WST Operation.

Currently the system is being used for wet weather only; most flows enter the pump station after decanting into the west box where the baffle at 990 feet has screened out much of the floatables. At the beginning and end of each storm event, when the water level is below 990 feet, flows from the east box enter the pump station. This is a condition of maximum loading at minimum flows and more closely parallels the anticipated dry weather condition.

Modifications currently being designed include replacing the existing bar screens in the east chamber so that the spacing is increased to 1 1/2 inches and adding 1/2 inch screens upstream of the grit chambers at OWPCP. Within the pump station, the east bar screens will have 1 1/2 inch spacing and the west bar screens will retain the 3/4 inch spacing. The wider spacing will help alleviate the excessive buildup of screenings and eliminate the need for increased screenings handling and storage capabilities at WSS. In addition, a screenings grinder is currently being tested at the North Shore Pump Station. If successful, the grinder will be installed under the east bar screen further reducing the amount of dry weather screenings to be handled at the pump station. The reduced volume of screenings captured will also mean a reduction of possible odor sources within the pump station.

The 1 1/2 inch spacing will provide adequate screening to protect the lift pumps pumping to the OWPCP. The 3/4 inch spacing in the west sump will be maintained to prevent debris from clogging the openings of the diffusers at the SWOO. These modifications will make it unlikely that the east chamber will be used to pump flow to the SWOO since the larger

bar screen opening would allow clogging of the SWOO diffuser. In the event that the east chamber is used to pump sewage to SWOO an alarm will be sounded at the pump station and Oceanside.

Additional improvements to the bar rack system include a possible expansion of odor control units to handle dry weather influent flow.

Preliminary analysis of the hydraulics through the pump station shows that the steep (0.056) slope in the influent channel leading to the bar racks may create an hydraulic jump. This condition could affect the screenings removal efficiency of the bar racks and generate a large force acting upon the bar screens.

An operating level of 968 to 973, the invert elevation at the end of the east box, is proposed for the WSS wet well . The variable speed pumps will be able to maintain the desired operating level in the wet well over a range of flows. A higher operating level of 980 feet would result in the east box being flooded back to Rivera Street. At the 973 foot operating level, the velocity through the bar screens will be:

Flowrate (mgd)	Velocity* (fps)
21	3.69
43	6.82
65	7.75

* based on 0% blockage in bar screens with 1 1/2 inch openings

C. INFLUENT PUMPING TO THE OWPCP

Raw sewage must be pumped through the east chamber of the WSS with sufficient head to reach the Pretreatment Building at the new Oceanside Plant. This Plant will be located south of the San Francisco Zoo, adjacent to the Great Highway approximately 2800 feet south of the WSS.

Between the WSS and the SWOO junction structure, the new influent line will run parallel to the existing 84" RCP line. The force main will pass to the east of the junction structure, following the Great Highway, and entering the Pretreatment Building from the west, on the northern end of the building. For exact routing, see Drawing C-30, OWPCP Volume 6. This routing avoids both the OWPCP piping gallery and the car and truck traffic within the plant. The last sixty feet of piping must leave the Great Highway alignment and head easterly toward the Pretreatment Building. This section will pass under the berm and will be difficult to access in case of a break or leak.

The new influent line will tie into the existing 48-inch line at the pump station at Vault No. 3, where blockouts in the wall were originally provided for this purpose (Figure 7). The magnetic flowmeter in Vault No. 1 can be used thus avoiding the cost of a new flowmeter and vault. The 16" flushing line and the 1" PVC sodium hypochlorite line will follow the same routing as the influent force main from Oceanside to within 125 feet of the pump station. It is expected that one trench will accomodate all three lines. See Drawings C-28, 29 and 30 for exact routing.

The WSS pumps must be able to meet the hydraulic requirements of both influent pumping to the OWPCP and decant pumping to the SWOO. A 6 mgd minimum SWOO discharge rate is required to prevent biofouling when 21 risers are open. In response to the July 28, 1987 letter from Chris Phanartzis of Hydroconsult Engineers and subsequent conversations, a total wet weather treatment capacity of 153 mgd was established. This consists of a maximum wet weather capacity of 65 mgd at the OWPCP coupled with an 88 mgd discharge of decant from the WSS to the SWOO. This discharge rate would result in an average of 8 overflows per year when 65 mgd is maintained from the onset of each storm event. Since an instantaneous rise from 6 or 8 mgd to 65 mgd is not possible, a ramp up time of between one and two hours is expected. Further analysis by C. Phanartzis is needed to determine whether 8 overflows per year can be maintained with the anticipated two hour delay in reaching 65 mgd. An additional lift pump is being considered for the Vicente West Box should this delay result in an excess of 8 overflows per year.

The WSS lift pumps in each chamber can match the flow rates of 6 to 65 mgd and also pump 43 mgd with one pump out of service. However, there are some limitations. If a 42 inch force main were to be used, 65 mgd could be pumped with the WST level at about 992 ft. At elevation 973, the station could pump about 57 mgd without backing up . For the case of one pump out of service, 43 mgd could be pumped with two pumps when the WST level is at elevation 976. If a 48 inch force main is used, 65 mgd can be pumped when the WST level is about elevation 979 and the station can pump about 63 mgd at elevation 973. For the case of one pump out of service, 43 mgd can be pumped at elevation 973. This is summarized in the Table below.

Flowrate	**42" FM**	**48" FM**
(mgd)	water surface elev.	water surface elev.
6	973*	973*
21	973	973
43	976	973
65	992	979

* Speed on pump must be reduced or throttling valve used to meet these conditions

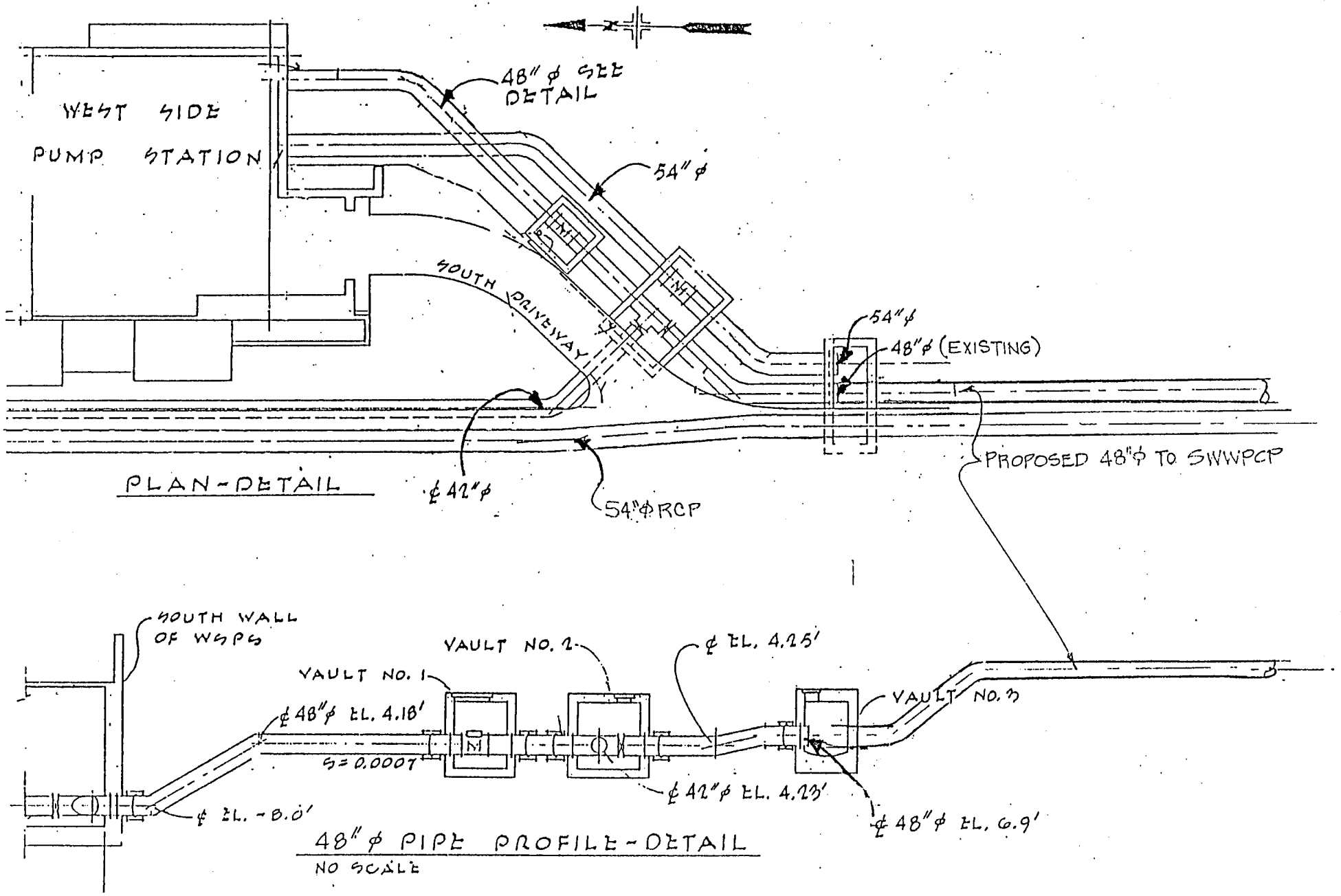


FIGURE 7.
PROPOSED CONNECTION FOR SWWPCP INFLUENT FORCE MAIN

In order to meet the required 8 overflows per year, 65 mgd must be pumped from the onset of a storm, before the water level in the WST has risen to 992. For this reason, the 48 inch force main is preferable to the 42 inch line. A disadvantage in using the 48 inch force main will be a decrease in downstream velocities. Note that there is a rise in water surface with the 48" discharge line before the 65 mgd rate is met which will require an analysis by C. Phanartzis.

A 48" force main is being designed with a 0.2 percent slope down towards the WSS. This is to ensure drainage in the line in case of pump failure at the pump station. Recent field investigations on the westside have revealed significant grit and sand accumulation both within the 42" force main and the pump station itself. Additionally the pump station has experienced a sanding problem in the neighboring manholes and sewers. Recent discussions have centered on the potential for grit and sand deposition within the proposed 48" line. A dual, hydraulically equivalent force main is currently being considered. Two 36" lines rather than one 48" line would offer higher velocities at low flows, decreasing the potential for sand deposition. This increased flexibility would come at an increase in capital and maintenance costs.

Pump Station operating flow rates and the corresponding heads at the OWPCP are summarized in Table 1., OWPCP Influent Force Main. System heads were plotted on pump curves for the existing high pressure pumps to find their operating heads. Similar tables would be developed for a dual force main to insure that the current TDH limits are maintained, avoiding any adverse impact to pumping capacity .

Total flow out of the WSS will continue to be 153 mgd after the Lake Merced Transport and the Richmond Transport are in operation.

D. OCEANSIDE WATER POLLUTION CONTROL PLANT

The Oceanside Water Pollution Control Plant will receive the pumped influent in the receiving structure ahead of the three bar screen/grit system influent channels. Diurnal flow through the plant is expected to range between 6 and 43 mgd. Either two channels will be open at all times or one channel will be open for flows from 6 to 21 mgd and two channels from 21 to 43 mgd in order to maintain a minimum velocity of 2 fps in the channels ahead of the grit tanks. During wet weather, three units will be put on line during pumping rates greater than 43 mgd and up to 65 mgd. Flow will gravitate through the treatment processes of the plant to the SWOO junction structure and out the SWOO. The downstream hydraulic control point at the junction structure is elevation 1005.8 which is calculated based on a 10 year high tide and 160 mgd out SWOO.

OWPCP INFLUENT FORCE MAIN

FLOW (MGD)	PIPE DIA. (IN.)	AREA (FT2)	VELOCITY (FPS)	STATIC HEAD (FT.)	REYNOLDS #	f *	FRICTION LOSS* (FT.)	MINOR LOSS (FT.)	TDH (FT.)
				DRY WEATHER FLOW					
3	36.00	7.07	0.66	58.00	1.83E+05	0.018	0.11	0.07	58.18
6	36.00	7.07	1.31	58.00	3.66E+05	0.017	0.43	0.27	58.70
10	36.00	7.07	2.19	58.00	6.10E+05	0.0163	1.15	0.74	59.89
20	36.00	7.07	4.38	54.00	1.22E+06	0.016	4.50	2.98	61.47
38	36.00	7.07	8.32	51.00	2.32E+06	0.016	16.24	10.74	77.98
40	36.00	7.07	8.76	51.00	2.44E+06	0.0155	17.43	11.91	80.34
6	48.00	12.57	0.74	52.00	2.74E+05	0.0155	0.09	0.08	52.18
21	48.00	12.57	2.59	52.00	9.60E+05	0.015	1.10	1.04	54.14
38	48.00	12.57	4.68	52.00	1.74E+06	0.015	3.61	3.40	59.01
43	48.00	12.57	5.29	52.00	1.97E+06	0.015	4.63	4.35	60.98
				WET WEATHER FLOW					
32.5	36.00	7.07	7.11	23.00	1.98E+06	0.0155	11.51	7.86	42.37
21	48.00	12.57	2.59	54.00	9.60E+05	0.015	1.10	1.04	56.14
43	48.00	12.57	5.29	54.00	1.97E+06	0.0145	4.47	4.35	62.83
65	48.00	12.57	8.00	54.00	2.97E+06	0.0145	10.22	9.95	74.17
65	48.00	12.57	8.00	23.00	2.97E+06	0.0145	10.22	9.95	43.17

TOTAL LENGTH OF PIPE = 2,834 FT.

Dry Weather STATIC HEAD = 1026 - 968 = 58 FT.
Avg. Wet Weather STATIC HEAD = 1026 - 973 = 54 FT.
Max Wet Weather STATIC HEAD = 1029- (1006) = 23 FT.

FRICTION LOSS = f (L/D) * V^2/2G
* e/D for 36" is 0.001/3 = 0.000333
e/D for 48" is 0.001/4 = 0.00025

MINOR LOSSES = K * V^2/2G
K FACTORS FOR MINOR LOSSES:

MINOR LOSSES WITHIN PUMP STATION		K = 7.5
1 - 90 DEGREE BEND @ 1.0		K = 1.0
EXIT LOSS		K = 1.0
2 GATE VALVES (OPEN) 2 @ 0.2		K = 0.4
	TOTAL	K = 9.9 (use K =10)

revised 12/8/89

DRY WEATHER OPERATION

ANALYSIS OF OPTIONS

An existing 54-inch pipeline is currently discharging RSWPCP effluent to the SWOO. The 54-inch pipeline is encased in concrete in the east shelf of the east box of the WST structure (see Figure 5). In the future, raw sewage must be conveyed to the WSS to be lifted up to the OWPCP. Raw sewage can be conveyed through the WST to the WSS in one of two ways:

1. Raw sewage can be conveyed down the 8 feet wide cunnette at a 0.2 percent slope. The cunnette was designed for this purpose. Raw sewage will enter the WST at:

	% flow
Fulton Street	33
Lincoln Way	27
Noriega Street	3
Pacheco Street	3
Rivera Street	3
Vicente Street	31

With the completion of the proposed Lake Merced Transport (LMT), flows from the Upper and Lower Lake Merced drainage districts will be diverted to the LMT entering the WSS directly at Sloat Blvd. The above percentages will be then be adjusted to:

Vicente Street	15
Lake Merced Transport	16

The drops at all of these locations would be conveyed via a pipe into the cunnette in order to control the flow and avoid turbulence and odor release. The main advantage to this option is that it has the shortest possible time of travel for all of the flows. Diversion of the flows at Vicente Street will allow the closure of the Vicente Pump Station. Disadvantages include the three to twenty five foot drops into the cunnette, and the inconvenience to the public caused by further construction along the Great Highway . In addition, reduced dry weather flows at Lincoln will result in decreased velocities and possible unwanted sediment depositions.

A second option is that the Noriega, Pacheco, Rivera and Vicente Street contributions continue on their current path and enter the cunnette at Lincoln Way. Figure 8. shows the elevations for each of the drop outs and the corresponding elevation of the WST at each location. An advantage of the second option is the lack of three to twenty five foot drops and ensuing turbulence and odor potential, as well as higher flows and velocities

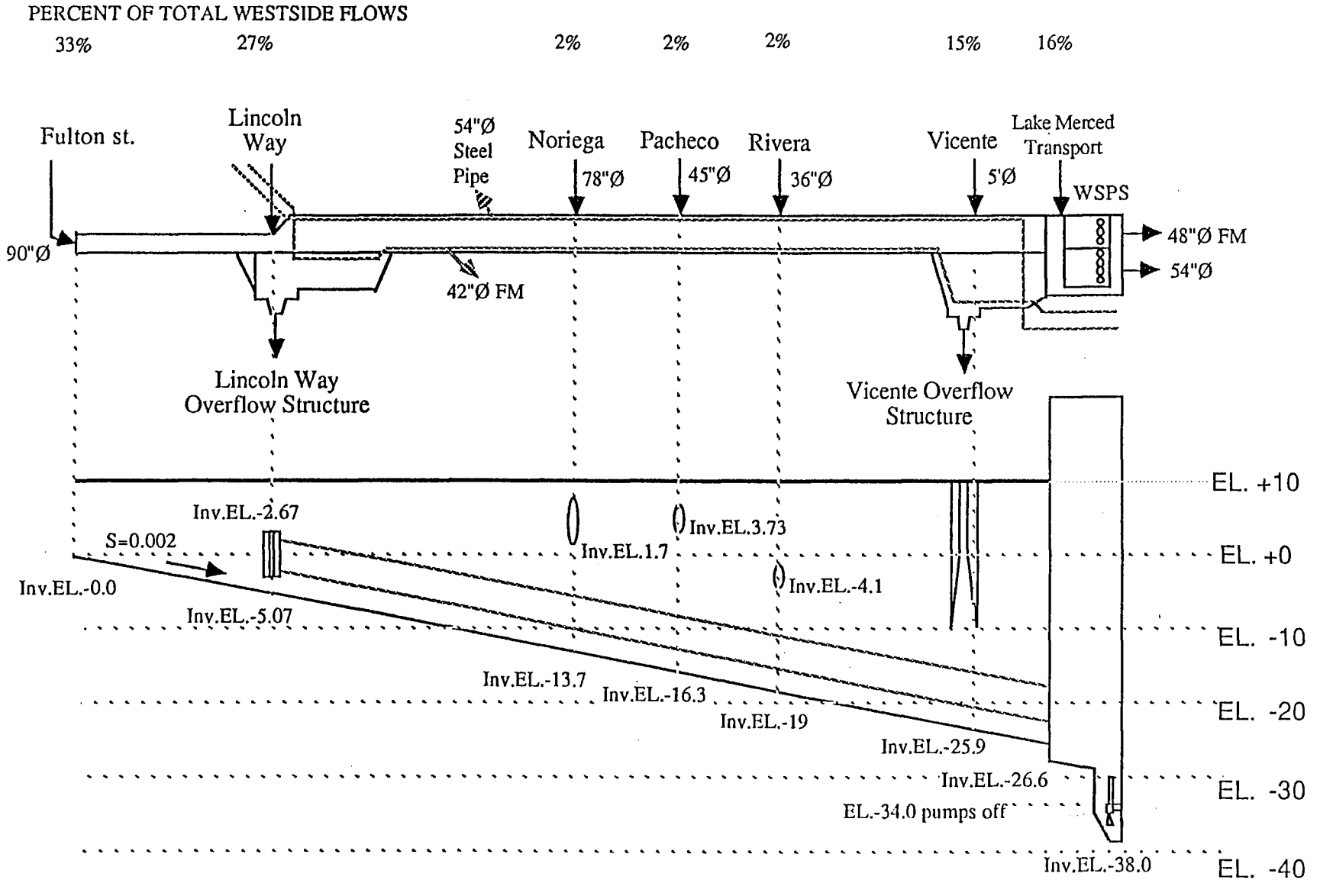


FIGURE 8. WESTSIDE TRANSPORT STRUCTURE
DROPOUT LOCATIONS AND ELEVATIONS

in the sanitary sewers. This option utilizes the sewer system now in place and requires construction at Vicente Street only. The main disadvantage is the increased time of travel for flows, particularly from Vicente Street.

2. Raw sewage can be conveyed to the WSS through the 54-inch line currently being used for RSWPCP effluent. There are two possible options as before. Raw sewage can enter the 54-inch line directly at Fulton, Lincoln, Noriega, Pacheco, Rivera, and Vicente Streets or gravity flow to Lincoln Way before entering the 54-inch line. A preliminary analysis by Norman Chan and Tom Landers indicated that the connections required to bring the raw sewage into the 54-inch pipeline will cost in the order of $1,000,000. This is not considered cost effective at this time.

The following means of conveying dry weather flows to the WSS are recommended:

- Richmond District flows will travel along Fulton Street and enter the cunnette via the 90" CPR at the Great Highway (See Figures 9 and 10)
- Sunset District flows will travel to Lincoln Way and enter the cunnette via the 60" RC sewer
- Flows from Judah, Noriega, Pacheco and Rivera Street will continue in the existing sewer lines to Lincoln Way where they will join the 60" RC sewer flow into the cunnette. Since these drop outs total less than 9 percent of the total Westside flows, additional construction expense to reroute these flows does not seem justified.
- With the completion of the proposed LMT flows from the Upper and Lower Lake Merced drainage districts will be diverted to the LMT, entering the WSS directly at Sloat Blvd.
- Flows from Upper and Lower Vicente drainage districts, except for the .1 mgd which drains to the Vicente Pump Station, will also continue in the existing sewer lines to enter the cunnette at Lincoln Way. Although this extends the time of travel of these flows, the increased velocities may be needed to prevent sediment deposition at Lincoln Way.

DRY WEATHER CONNECTIONS TO EXISTING SEWER LINES

The WST was designed and built to accomodate flows directly from the Fulton Street and Lincoln Way sewers. The Westside Activation Contract (W-7) directed wet weather flows into the WST, while diverting dry weather flows to RSWPCP. Sewer connections on both Fulton Street and Linoln Way will need to be modified in order to send both dry and wet weather flows directly to the WST.

RICHMOND DISTRICT

Fulton Street Flows - Great Highway to 48th Avenue

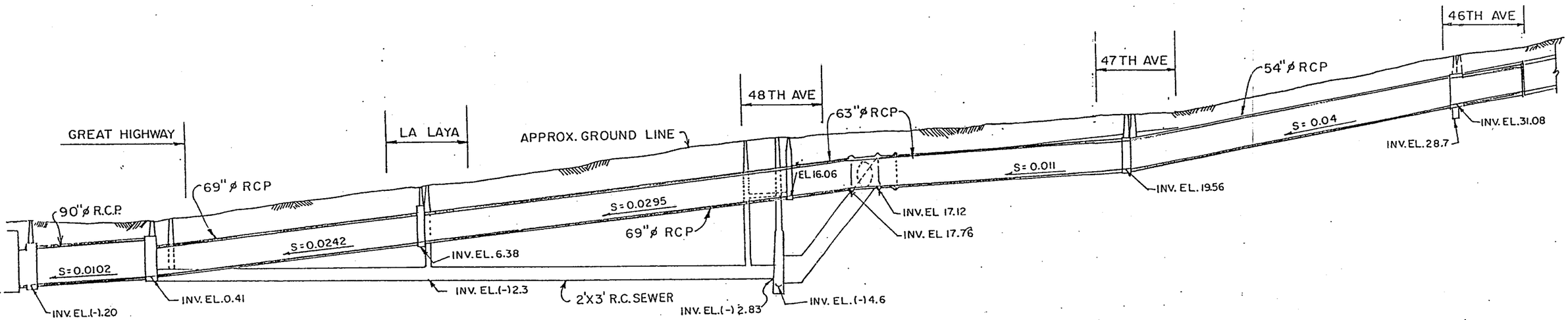
Currently, the 69" reinforced concrete pipe (RCP) sewer slopes toward the Great Highway, joining with a 90" RCP that flows directly into the cunnette in the WST (Figures 9 and 10). Diversion Structure No.1 diverts dry weather flow at the Great Highway into the 2'x3' line, sends it back to the Fulton Pump Station (FPS), and from there to RSWPCP for treatment.

Before the existing 2'x3' can be abandoned, a field investigation must be made to determine if all the side sewers which currently connect to the 2'x3' have been intercepted. The Westside Activation Contract (W-7) redirected flows in the 12-inch VCP at both La Playa and the surrounding catch basins, from the existing 2'x3' to the new 69" RCP. The only remaining flow in the 2'x3' is the dry weather flow from the 69" that has been diverted from the WST at Diversion Structure No.1 and the dry weather flow from the 12" VCP at 48th Avenue. It is recommended that the 2'x3' sewer be abandoned, the diverting sump be filled, and dry weather flows allowed to flow directly into the WST via the 90" line. If at some point in the future it becomes necessary to route dry weather flows away from the WST, the 2'x3' may be used. It is recommended that the 2'x3' sewer not be permanently sealed off until it is certain that dry weather flows into the cunnette do not cause excessive odor problems.

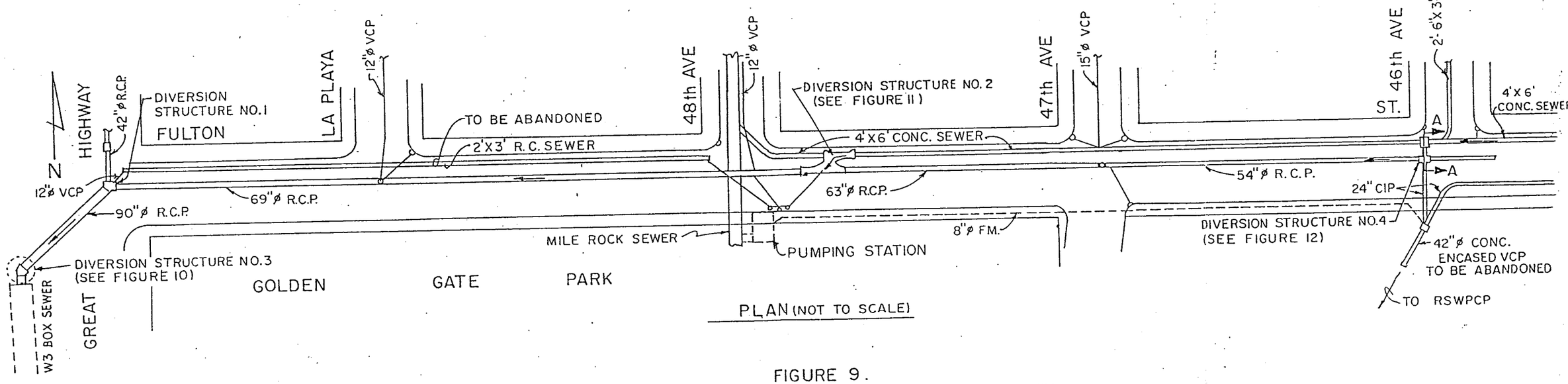
Fulton Street Flows - 48th Avenue to 46th Avenue

At 48th Avenue, two additional lines, one from the north and another from the east deposit dry weather flows at the Fulton Lift Station (FLS) (Figure 11). The W-7 contract diverted the 12' VCP wet weather flows to the new 69" RCP, while leaving dry weather flows from the 12"VCP to drop out into the existing 2'x3'. From there they continue onto to the FLS via a 10" RCP. The 12" VCP invert is lower than the 4'x6', consequently, this line must be raised before dry weather flows can be diverted into the 69". Dry weather flows from the east are diverted to the FLS via an 8" VCP (Figure 10). This could be plugged quite easily, retaining both dry and wet weather flows in the 63" line.

Once these flows have been diverted from the FLS, it is recommended that the FLS, which currently lifts the flows to the RSWPCP, be abandoned. The pump station is antiquated and presents a number of safety hazards. In addition, it is on Golden Gate Park property. If a pump station is later needed for Fulton Street flows, it is recommended that a new pump station be built or the existing station renovated. At 47th Avenue, dry weather flows will continue in the 4'x6' line, since these flows will be diverted into the 63" RCP at 48th Avenue.

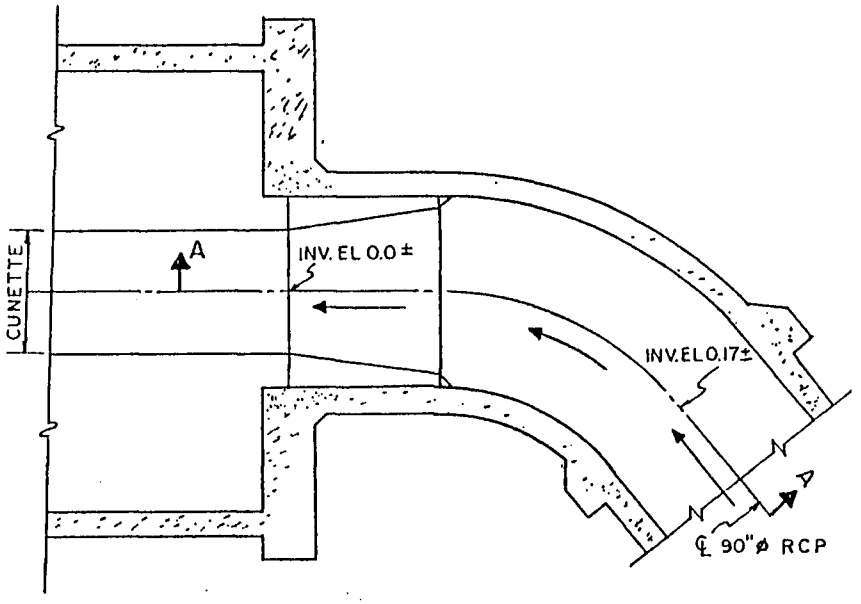


PROFILE

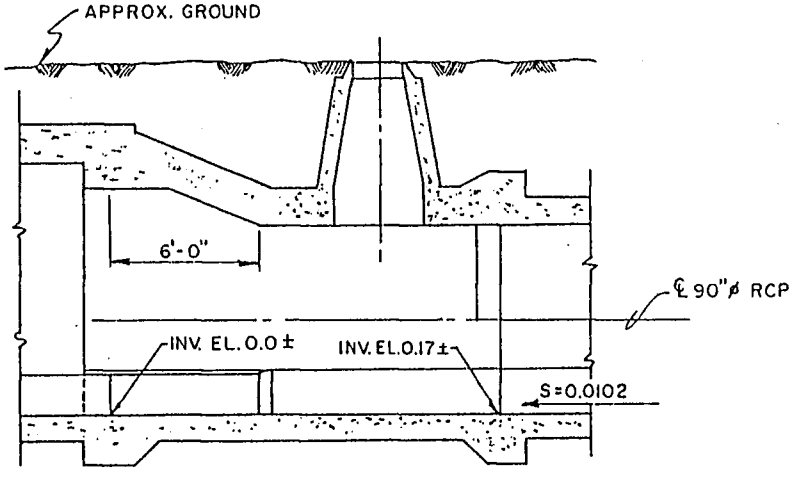


PLAN (NOT TO SCALE)

FIGURE 9.
SEWER LINES - FULTON ST., 46 TH AVE TO GREAT HWY



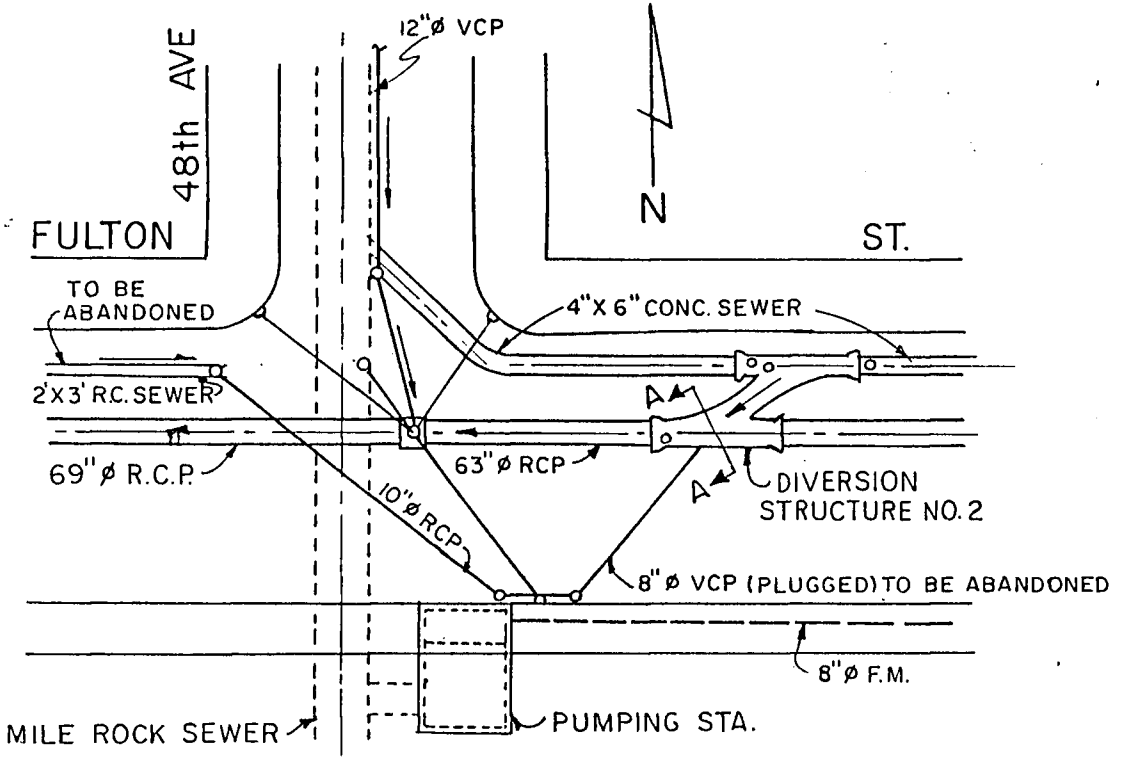
SECTIONAL PLAN

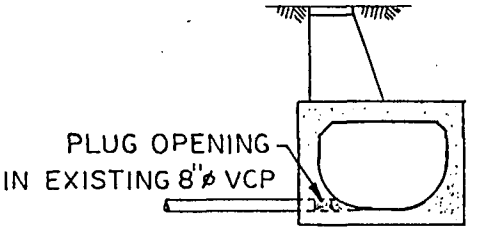


SECTION A-A

FIGURE 10

DIVERSION STRUCTURE NO. 3
FULTON STREET AND GREAT HIGHWAY

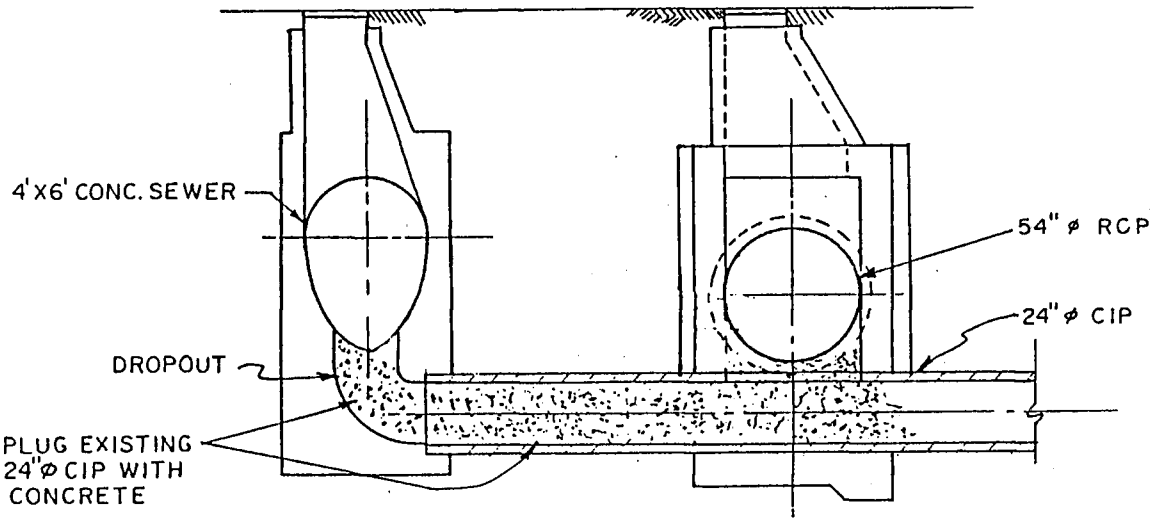




ENLARGED SECTION A-A

FIGURE II

INTERSECTION FULTON ST. AND 48th AVE



SECTION A-A

FIGURE 12
DIVERSION STRUCTURE NO. 4
46TH AVE AND FULTON ST.

Fulton Street Flows - 46th Avenue to Richmond Tunnel

At 41st Avenue, the 4'x6'6" Richmond Tunnel connects to the 3'6" x 5'3" sewer. The 3'6"x5'3" sewer converts to the 4'x6' sewer at 43rd Avenue. This 4'x6' line along with the existing 24" CIP (Cast Iron Pipe) carry all dry weather flows upstream of 46th Avenue to the RSWPCP. This system is currently operating at capacity. During wet weather, man holes frequently flood onto the street. If the 24" CIP were plugged and flows diverted into the 4'x6', this problem would be exacerbated. It is recommended that the 54" pipe (or a smaller size pipe to be determined) be extended back to 41st Avenue. This would increase the flow capacity at this location, allow the 24' CIP to be plugged and divert dry weather flows from the RSWPCP.

SUNSET DISTRICT

Lincoln Way Flows

On the south side of Golden Gate Park, three sewer lines enter the WST at Lincoln Way (See Figure 13). The 3 compartment box sewer, which originally ended in thee Lincoln Way Overflow Structure, now transports much of the district's wet weather flows into the WST. The 54" gravity line from the RSWPCP carries effluent through the WST to the WSS and on to the SWOO. The third line, a 60" RC sewer, was extended back to 48th Avenue by the W-7 Contract. It currently collects dry weather overflows and could be used to carry all Lincoln Way dry weather flows to the WST.

At Lincoln Way and La Playa, a 3'6" x 5'3" sewer collects dry weather flows east to the Diversion Structure #11 while wet weather flows over to the 3 compartment box sewer. The 8'6" Mile Rock Sewer heads north from 48th Avenue, passes under Diversion Structure #11 on its way to the RSWPCP. At 48th and Lincoln Way, Diversion Structure #11 diverts wet weather flow to the newly constructed 63" RC sewer, while dry weather flows continue on to the RSWPCP. This diversion structure can be modified, as shown in figure 14, so that both these dry weather flows are directed into the 63" R.C. sewer .

At 46th Avenue and Lincoln Way, dry weather flow is diverted to a 30" influent line to RSWPCP. This flow would be left in the 66" spun R.C.P. to continue onto 48th Avenue. A new line and possibly a junction structure would be constructed in order to divert dry weather flows from the 66" RCP sewer into Diversion Structure #11. The drop out at Diversion Structure #11 will need to be enlarged to accomodate the increased flows. From there it would join the other dry weather flows into the 63" RCP line to the WST.

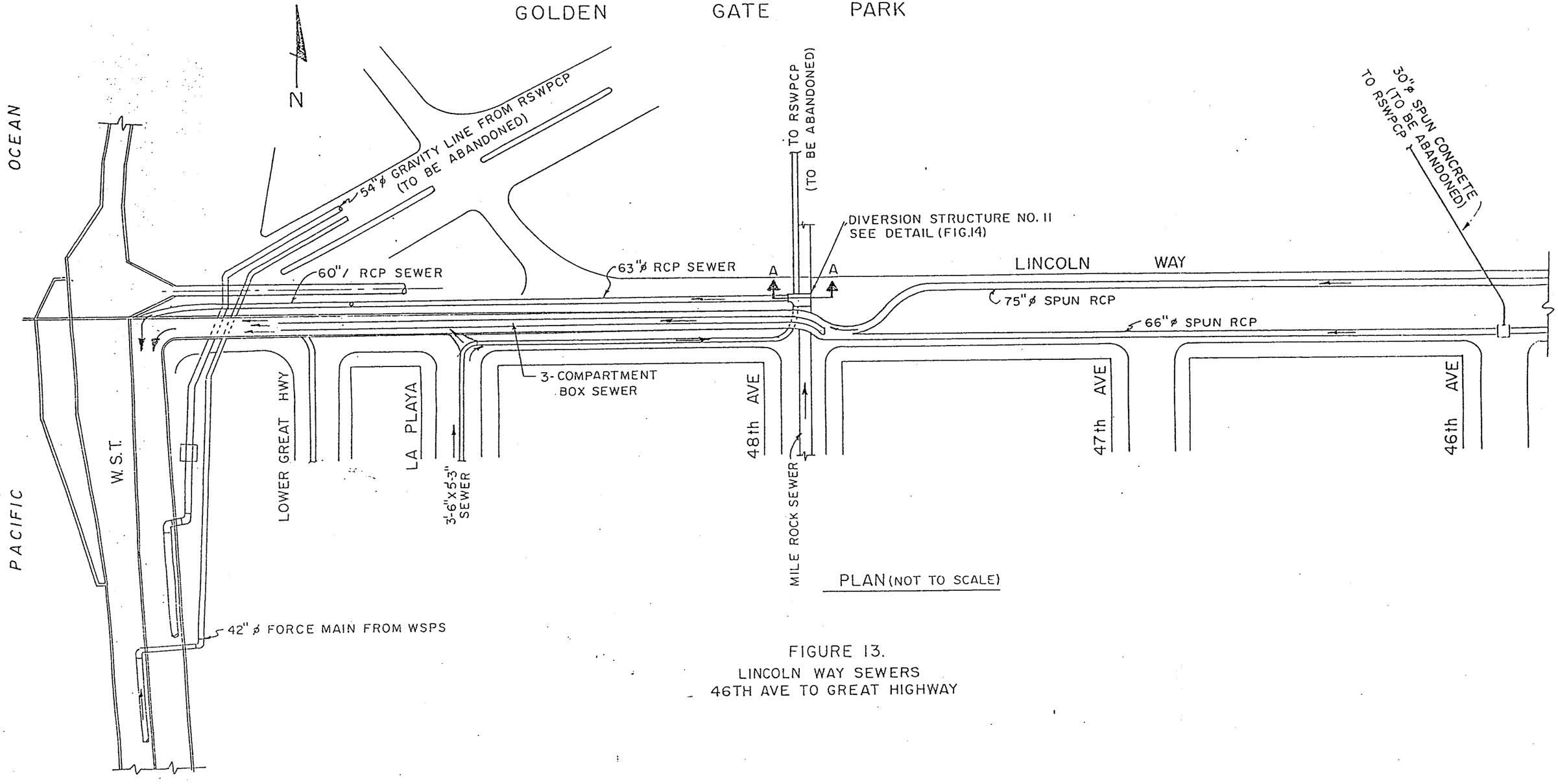


FIGURE 13.
LINCOLN WAY SEWERS
46TH AVE TO GREAT HIGHWAY

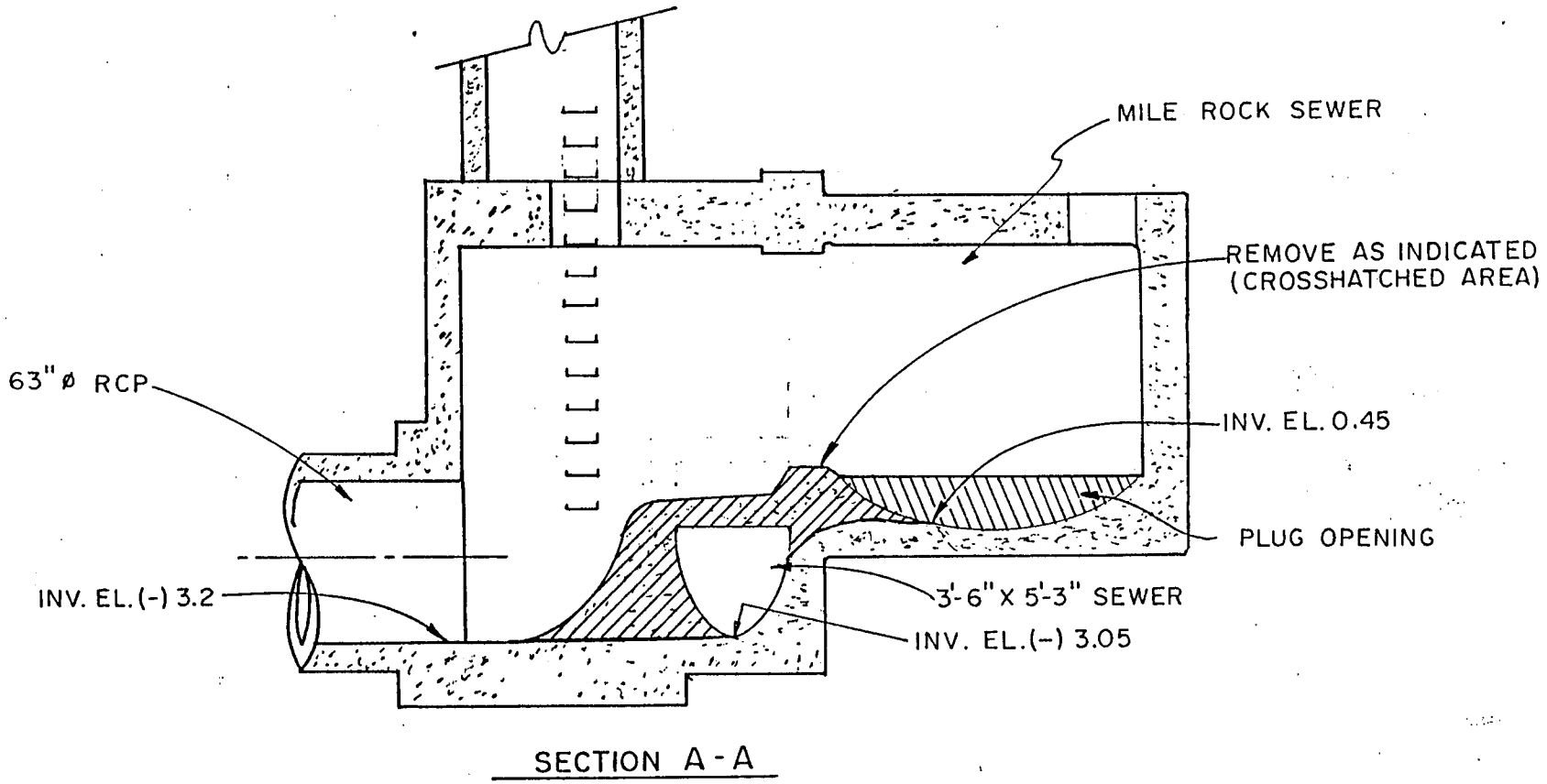


FIGURE 14.
DIVERSION SRUCTURE NO. II
LINCOLN WAY AND 48TH AVE

Vicente Street Flows

Currently, dry weather flows from Upper Lake Merced and Upper and Lower Vicente Drainage districts follow a northerly route to the RSWPCP. Dry weather flow from the remainder of the Lake Merced area enters a large trunk sewer which follows first a southerly and subsequently a westerly direction to the Lake Merced Pump Station (LMPS). Here, the LMPS pumps the dry weather flow to a 48" gravity sewer which caries these flows into the lower Vicente area outside the Lake Merced watershed. Eventually these flows join with other flows and are directed northward to the RSWPCP for treatment.

After construction of the Lake Merced project, flow from the upper 1000 acres which currently exits the Lake Merced watershed and flows in a northward direction by gravity will be prevented from doing so by plugging the entrance to the small northward flowing interceptors. Instead, all dry weather flows from the Lake Merced Watershed will enter the LMT. The reason for this intended action is to increase the dry weather flow in the proposed Lake Merced Tunnel as much as possible for sediment flushing purposes.

At Vicente and the Lower Great Highway, the 8" dry weather line to the Vicente Pump Station will be rerouted to direct flows into the WST, allowing the Vicente Pump Station to be abandoned. With the exception of this 8" dry weather line, all remaining sewers will be left in place in order to maintain the maximum dry weather flow entering the cunnette at Lincoln Way.

WESTSIDE PUMP STATION (WSS) AND TRANSPORT (WST) OPERATION

Under the Oceanside Contract, a redundant Distributed Control Unit (DCU-8) will be installed at Westside Pump Station (WSS) to replace the existing Modicon 584 Programmable Logic Controller (PLC), located in the Control Room at WSS, and some of the functions of the PLC at the Richmond Sunset Water Pollution Control Plant (WPCP). The DCU will execute functions similar to those performed by the existing PLCs for the control and monitoring of the station equipment, nearby Westside Transport level monitors and valves, and remote equipment in the north end of the transport, as well as new functions required for the Oceanside WPCP (OWPCP) integration. The DCU will be an integral part of the Oceanside Distributed Control System (DCS).

Under the forthcoming WSS Clean-up Contract, the present separate Remote Terminal Units (RTU) systems, used for the transmission of the PLC control and monitoring signals for the remote transport equipment, will be replaced with remote Input/Output (I/O) channels for the existing Modicon 584 PLCs located at the WSS and the Richmond-Sunset Treatment Plant. Under the OWPCP contract, these remote PLC I/O channels will be replaced with remote I/O modules, compatible with the DCU, for the control and monitoring of existing and new equipment at both the south and north ends of the transport structure.

SYSTEM CONTROL LEVELS

There are 3 Control Levels for the pump station's major equipment. From the bottom to the top of the control hierarchy, they are:

- **LOCAL:** The local control devices, located in the field near each piece of equipment, allow Manual (On, Off, etc.) control or Remote control selection. Selecting Remote will transfer control to the Control Panel level.
- **CONTROL PANEL:** The Control Panel is located in the station's control room. The panel's control devices provide selection of the 3 remote control modes which are described below. Selecting Auto remote control mode for the station and Auto control for the individual equipment will transfer the station's operational control to the the DCS level.
  NOTE: In the WSS documentation, this panel is referred to as the Central Graphic Panel (CGP)
- **DCS:** The DCS operator console(s) allow selection of the 3 remote control modes described below. The operational control logic for the station is executed in DCU-8, which is located in the pump station's control room.

There are only 2 Control Levels for the WST equipment: **LOCAL** and **DCS.** There are no control or display devices for this equipment on the WSS Control Panel.

SYSTEM REMOTE CONTROL MODES

There are 3 Remote Control Modes for the operation of the station's major equipment. These modes are:

- **AUTO**
- **MANUAL ASSIST**
- **MANUAL**

At the pump station these control modes are selected by the

AUTO / MANUAL ASSIST / MANUAL

selector switch on the Control Panel. The Auto and Manual Assist station control modes are implemented by the DCU. In these two modes, the remote manual control devices on the Control Panel are isolated (disabled) by individual open relay contacts. The Auto control enables the remote control of the station by the Oceanside DCS operator console(s). The Manual Assist mode enables the Operational Mode Selection pushbuttons (Modes 1 thru 5) on the WSS Control Panel. Manual mode enables the hardwired manual control devices on the WSS Control Panel for the individual equipment. In the Manual control mode, the DCU control outputs are isolated (disabled) by individual open relay contacts.

The major WSS and WST equipment controlled by these remote control modes are:

	Tag Number
• **WSS Gates**	
* East Upstream Head Gate	01G6–1
* East Downstream Head Gate	01G8–1
* West Upstream Head Gate	01G6–2
* West Downstream Head Gate	01G8–2
* Inlet Crossover Gate	01G7
• **WSS Valves**	
* East Sump Discharge Valve	01V11–5
* 54" SWOO Discharge Valve	01V11–6
* Discharge Crossover Valve	01V11–7
* 48" OWPCP Discharge Valve	01V11–8
* 42" RSP Discharge Valve (To be abandoned	01V11–9
• **WSS Pumps:**	
* East Main Lift Pumps Nos. 1, 2 & 3	01P1–1 to 01P1-3
* West Main Lift Pumps Nos. 4, 5, 6 & 7	01P1–4 to 01P1–7
• **Other WSS Equipment:**	
* Bar Rack No. 1 (east)	01M5–1
* Bar Rack No. 2 (west)	01M5–2
* Grinder (east)	01M4

- **WST Valves**
  - * WST Lincoln West Box Valve #1 01V11–1
  - * WST Lincoln West Box Valve #2 01V11–2
  - * WST Vicente West Box Valve #3 01V11–3
  - * WST Vicente West Box Valve #4 01V11–4
  - * WST Lincoln West Box Flush Valve 01V19–1
  - * WST Vicente West Box Flush Valve 01V19–2

At all times the DCU will monitor the status of all major gates, valves and pumps, selected auxiliary equipment, alarm devices, analog process devices and remote control and operational modes (Modes 1 thru 5). Each remote control and operational mode is discussed below in more detail.

MANUAL

There are 3 levels of Manual control of the station's equipment: Local, Central Panel and DCS. The level selected depends on the Local and Control Panel mode selector switch(s) positions for each piece of equipment, and for Control Panel and DCS Manual control, the position of the remote control mode selector switch on the WSS Control Panel as shown below in Table 1. There are only two levels of Manual control for the WST equipment, i.e., local and DCS, and the WSS remote control selector switch position has no effect on their controls.

TABLE 1: MANUAL CONTROL LEVELS
CONTROL SWITCH LOCATIONS AND POSITIONS

	LOCAL	CONTROL PANEL		DCS OPERATOR CONSOLE	
CONTROL LEVEL		Individual Equipment Control	Remote Control Mode Selector	Individual Equipment Control	Remote Control Mode Selector
WSS EQUIPMENT					
Local	Manual	–	–	–	–
Control Panel	Remote	Manual	Manual	–	–
DCS Operator Console	Remote	Automatic	Automatic	Manual	Manual
WST EQUIPMENT					
Local	Manual	–	–	–	–
DCS Operator Console	Remote	–	–	Manual	-

Under Manual control, the pumps, gates and valves are operated individually and independently of each other through the Manual controls available at the DCS operator console(s), the WSS

Control Panel or the equipment local control panels. The pumps can be turned on and off and the pump speed(s) chosen to produce a desired flow, each gate and valve can be opened and closed and the bar screens and the grinder operated under their manual controls.

Under any level of Manual control, the DCS will monitor, record and graphically display the status of all equipment. Under DCS Manual control the computer will monitor which gate and valve alignments are chosen, and will warn the operator via an alarm message and request control command confirmation before implementing a command to open a particular gate or valve which will cause the discharge of undecanted flow (WST East box flow) to SWOO.

The situations described below illustrate instances where remote or local manual control may be necessary .

POWER FAILURE CONDITIONS

1. PG&E Power at WSS, no power at OWPCP East Sump Off West Sump to SWOO

In the event of a power failure at the OWPCP, the pump station may be run in Manual or Manual Assist depending upon the operator's discretion and what computer assistance is still available. The East and West Upstream Head Gates, 01G6–1 and 01G6–2, will be closed so that flow will back up in the East Box. When the water level rises above elevation 990, flow will decant into the Vicente West Box. All flow will be stored as long as required or as possible before being allowed to flow into the west pump chamber and pumped directly to the SWOO to prevent an overflow condition. The west pump chamber should have to be used because the wider spacing (1 1/2 inch) in the bar screens in the east pump chamber would allow debris to clog the openings of the SWOO diffusers.

2. No PG&E power at WSS, no power at OWPCP

If both the OWPCP and the WSS have no power, gates to both WSS pump chambers must be closed. If power is out for two days during Dry Weather conditions, the storage capacity of the WST will be exceeded and decanted sewage will overflow onto Ocean Beach at the Vicente and Lincoln Way Overflow Structures.

The WSS emergency generator supplies power for the main station control panels–DCU panel, Control Panel (Central Graphic Panel), Annunciator Panel and Relay & Termination (R&T) panel-, the East and West Downstream Head Gates- 01G8–1 & –2-, the bubbler compressors for the level sensing equipment and the Life-Safety equipment, such as, emergency lighting and receptacles, certain ventilation equipment, telephone system, fire and intrusion alarm systems, etc.

MANUAL ASSIST

There are 2 levels of Manual Assist remote control for the pump station equipment: WSS Control Panel and DCS operator console. Table 2 below indicates the required control switch positions for the two levels.

There is no Manual Assist control level for the WST Valves.

TABLE 2: WSS MANUAL ASSIST CONTROL LEVELS

CONTROL SWITCH LOCATIONS AND POSITIONS

	LOCAL	CONTROL PANEL		DCS OPERATOR CONSOLE	
CONTROL LEVEL		Individual Equipment Control	Remote Control Mode Selector	Individual Equipment Control	Remote Mode Selector
Control Panel	Remote	Automatic	Manual Assist	N/A	N/A
DCS Operator Console	Remote	Automatic	Automatic	Automatic	Manual Assist

Under Manual Assist control, the operator is able to select the WSS operational mode by pressing the appropriate Mode pushbutton (1 thru 5) on the WSS Control Panel, or selecting the mode (1 thru 5) on the DCS operator console. Once a operational mode is selected, the DCU properly aligns the gates and valves and controls pumps according to a previously determined procedure. Under Manual Assist the operator will have the option to select manual speed control of the main lift pumps or to let the DCU control the pump speeds automatically according to the 'Pump Control Sheets' included in this memorandum.

The following WSS Operational Modes can be selected under the MANUAL ASSIST Control Mode–either at the DCS operator console(s) or at the WSS Control Panel:

MODE 1: Off
MODE 2: East Sump to OWPCP, West Sump off
*** Flushing: Fill Lincoln West Box**
MODE 3: East Sump to OWPCP, West Sump to SWOO
MODE 4: East Sump Off, West Sump to OWPCP
MODE 5: Clean West Sump

AUTOMATIC

Normally, the WSS is operated as an unmanned pump station in the Automatic (Auto) remote control mode from the OWPCP operator console(s).

There is no Automatic control mode for the WST equipment.

For the Auto remote control mode, the station control devices will be in the following positions:

- All operational equipment Local controls: **REMOTE**
- Their Control Panel equipment controls: **AUTO**
- The Control Panel remote control mode selector switches: **AUTO**
- The WSS DCS control mode: **AUTO.**

The control of all the WSS and the WST major equipment will be from the Operator Console(s) for the Distributed Control System (DCS) at Oceanside. Under normal operating conditions, the WSS DCU (DCU–8) will automatically select between Operational Modes 2 and 3 which are described in detail below.

If either of these modes is to be selected by the DCS operator, independently of the Auto level conditions, or if any other WSS operational mode (Mode 1, 4 or 5) is desired, the DCS remote control for WSS must be switched to Manual Assist and the desired operational mode selected.

Under Auto control, flow directed into the east pump chamber is pumped to the OWPCP and flow directed into the west pump chamber is pumped to the Southwest Ocean Outfall (SWOO). Automatic selection between Modes 2 & 3 will be based on level conditions in the east and west boxes directly upstream of WSS, the present mode, which must be 2 or 3, and the west pump chamber (#2) level. See Table 3 below.

TABLE 3: CONDITIONS AND CRITERIA FOR WSS MODE TRANSITIONS IN AUTO

Mode Transition	East Box Level	West Box Level	West Pump Chamber (#2) Level
	LT–01–9	**LT–01–10**	**LT–01–16–2**
From Mode 2 to Mode 3	**≥17 Ft (El 989)**	**≥ 5 Ft (El. 977)**	–
From Mode 3 to Mode 2	–	**≤ 1 Ft (El. 973)** OR **≤ 5 Ft (El. 966)**	

NOTE: If the station is transitioning from Mode 3 to Mode 2 and the conditions for Mode 3 are re-established, then this transition should be stopped before completion and Mode 3 should be activated again. On graphic displays during a Mode transition, the displayed Mode number to which the station is transitioning should flash. When the transition is complete the Mode number should stop flashing.

As long as the flow in the WST East Box is below its decanting level (17 Ft. or El. 989), Mode 2 will be used. Water levels in the east and west boxes will reach predetermined levels (Table 3–above) before Mode 3 is initiated. Decanting from the east to west boxes must be verified by both box level setpoints before initiating Mode 3 because groundwater infiltration into the west chamber can be significant.

In short storm events, discharge of decanted flow to SWOO can be avoided by switching to Manual Assist and remaining in Mode 2. The west box can be used for storage and the stored decanted flow can later be pumped to Oceanside for treatment under remote DCS MANUAL control, since the valve and gate alignments do not correspond to one of the previously defined Operational Modes.

When in Mode 2 or 3, the pumps' sequencing and speeds (for variable speed drives) will be controlled by their respective sump level control algorithms, as detailed in the "PUMP CONTROL SHEETS" and in accordance with the "MODE CHANGE TABLES" up to the limit of the maximum OWPCP flow capacity signal. The maximum OWPCP flow capacity signal will be a manual flow setpoint entry in million of gallons per day (mgd) by the operator at a DCS operator console. The DCS will calculate and display a recommended maximum capacity setpoint. This calculation will be based on the number of on-line process units and their designated hydraulic capacities.

For the pump automatic sequencing routines, two or more pumps will never start simultaneously even multiple pump starts are requested. The DCU will sequence pumps on one at a time with aN adjustable time delay period of 1 to 60 seconds between each start.
In the case of reduced treatment capacity at the OWPCP, the WST can be used for temporary storage by lowering the specified maximum flow signal sent from the OWPCP DCS to the WSS DCU. At the onset of a storm event, the maximum flow can be raised from 43 to 65 mgd to increase the hydraulic capacity of the system and reduce the number of overflows. If the level in the east sump rises quickly, the increase in flow from 8 to 65 at the OWPCP will be controlled gradually over a specified amount of time. This amount of time can be adjusted to optimize plant treatment performance. For design purposes, this rise from 8 to 65 mgd will be allowed to occur over 2 hours, or at a maximum rate of 7 mgd every 15 minutes.

PUMP CONTROLS

The DCU determines which pumps are on and their speed acccording to sump level (see Appendix G: Pump Control Tables) and the Maximum Flow Signal sent from OWPCP (see Appendix F). Different control strategies are defined by the Operating Modes.

East Sump Controls

EO All pumps in the east sump are off

E1 Three (3) pumps are controlled according to level. Flow is pumped to the OWPCP. If two or three pump are on, both or all are at the same speed.

West Sump Controls

WO All pumps in the west sump are off.

W1 Two (2) pumps are controlled according to level when the west sump is used for DW flow. Flow is pumped to the OWPCP. If two pumps are on, both are at the same speed.

W2 Four (4) pumps are controlled according to level when the west sump is used to pump to the SWOO. The pumps are run at full speed.

W3 One (1) pump is controlled according to level when cleaning the west chamber. Flow is pumped to the OWPCP.

WSS OPERATIONAL MODES

MODE 1 OFF

In the OFF mode, the pumps are shut off and the WSS gates and valves are closed. This mode may be used during dry weather periods of low influent flow so that parts of the pump station can be made available for inspection or repair. Flow will be stored in the WST East Box, up to ~~9.1~~ 8.2 MG, before decanting to the west box.

MODE 2 EAST SUMP TO OWPCP WEST SUMP OFF

Mode 2 is used during all dry weather periods and the early parts of rainy periods when the water level in the WST East Box is 1 foot below the decant slots (elevation ~~989~~ 990, city datum + 1000). Influent gravitates to the inlet chamber through the cunnette in the East Box. Flow will enter the station from the East Box through the East Upstream and Downstream Head gates, 01G6–1 & 01G8–1, then pass through the coarse bar rack, 01M5–1, where large screenings that may damage the pumps will be removed and shredded by grinder 01M4. The flow will then continue into Pump Chamber No. 1 (east sump) from which it will be pumped to the OWPCP pretreatment facility. Equipment failure of the bar rack or the grinder will sound an alarm, but will not stop the pumping operation. Pump failure(s) will sound an alarm.

During dry weather conditions, the East Downstream Head Gate, 01G8–1, will be maintained at an intermediate open position when the WST East Box level is less than elevation 975 feet (or more than 15 feet below the decant elevation). The bottom of the gate will be maintained at an elevation of 975.5 feet to reduce the amount of the transport air being drawn into the pump station. When the water level reaches an elevation of 975 feet and after a preset time delay the

gate will open fully. When the level drops below elevation 975 for a period of 5 minutes, indicating the end of a storm event, the gate will return to the intermediate position.

When the water level in Pump Chamber No. 1 (east sump) reaches the elevation of 968, one of the three existing high pressure pumps will activate. As the flow increases, the pump speed will increase to maximum before the next pump starts up. Once two pumps are on line, their speeds will automatically adjust so that each pump lifts half of the combined flow. The pumps will be programmed to maintain a maximum sump level of 973.5 with a flow of 43 mgd. Flow will normally range between 6 and 43 mgd.

At the beginning of a storm event, when the level in the east sump continues to rise above elevation 973.5, three pumps will be on line to achieve a maximum pumping rate of 65 mgd. As long as the operator entered 'maximum flow signal' from the OWPCP confirms that the plant can accept 65 mgd, this flow rate will be maintained even as the level in the East Box rises.

Mode 2 can also be activated at the end of storms to dewater the lower edge below the decanting level of the WST East Box. Normally, during dewatering, a constant maximum flow of 65 mgd will be maintained and the static head may initially be decreased by up to 24 feet. This static head will increase as the water level in the East Box gradually drops. If 43 mgd is desired for treatment, the OWPCP operator can override this flow maximum by changing the 'maximum flow signal' sent to the WSS DCU (DCU–8). The stored flow pumped out of the box will then equal the difference between the dry weather flow rate and the 43 mgd. While dewatering, the pumps will continue to pump at either 65 or 43 mgd until the sump level drops below elevation 973.5. Once the operating level in the sump is reached, the amount of flow sent to the OWPCP will again be determined by the sump level and the maximum flow signal from the OWPCP.

Fill Lincoln West Box and Flush East Box

The DCU will supervise the flushing of the WST East Box from the West Box at Lincoln Way as a supplemental function to Mode 2. During flushing, two million gallons (MG) of treated effluent from the OWPCP will be pumped back to the Lincoln West Box using the existing 42" force main and the Lincoln West Box Flushing Valve, O1V19–1.

In order to maintain flexibility while using the 42" flushing line back to Lincoln Way, two different options will be available. If the valve, O1V11-2, in the Lincoln West Box is opened at the same time, or shortly after, the effluent pumps, 30P10–1 & –2, at the OWPCP are turned on, the influent flow through the cunnette will be supplemented by an additional 6 mgd. The resulting increase in velocities may help in scouring the cunnette. The treated effluent may be heavily chlorinated prior to pumping to provide a possible method of odor control within the East Box.

The second option is to leave the valve, 01V11-2, in the Lincoln West Box closed until the Lincoln West Box is filled. With effluent pumps at the OWPCP running at a maximum rate of 6 mgd, it will take about 8 hours to pump the 2 million gallons (MG) into the Lincoln West Box. When the level indicator in the Lincoln West Box reaches 1005.5, the valve, 01V11-2, in the Lincoln West Box will open and release the 2 MG stored flow as a means of scouring the cunnette. The 2 MG will join with the dry weather influent in the East Box gravitating to the WSS. This option also has the potential to be used as a means of odor control if sodium hypochloride (chlorine) is added to the treated effluent at OWPCP prior to pumping.

Although there has been limited success with this procedure to date, it is recommended that some means of flushing the East Box be included. Both alternatives will take place during periods of low flow when the influent into the East Box is less than 43 mgd, so that operations at the pump station will continue in Mode 2.

MODE 3: EAST SUMP TO OWPCP; WEST SUMP TO SWOO

During wet weather, the four WSS pumps in the west pump chamber (#2) pump decanted flow from the Vicente West Box to the Southwest Ocean Outfall (SWOO), while the three pumps in the east chamber (#1) pump raw sewage flow from the East Box to the OWPCP via the 48" force main. Storms that exceed the WST East Box storage capacity of 8.2 MG will cause the East Box water level to rise above the decant opening. Once the level in the East Box is above the intermediate (decanting) weir elevation (elevation 990, city datum + 1000), flow will decant from the East Box into the West Box at Vicente. At this point, all three pumps in the east pump chamber (#1) will pump 65 mgd to the OWPCP (if not limited by a lower 'maximum flow signal') and the pumps in the west pump chamber (#2), as controlled by their automatic DCU sump level controls, are activated successively, one at a time as needed, to pump decanted flow to SWOO.

The baffle walls between the East and both West Boxes will retain most floating materials, thus preventing floatables from being discharged with the decanted flow. In addition, the 3/4–inch bar screens in front of the west pump chamber (#2) will prevent larger objects from passing into the effluent line towards the SWOO and plugging the diffusers. The water level in the East Box and the Vicente West Box will continue to rise as long as the influent flow rate exceeds the WSS combined pumping rate to the OWPCP and the SWOO (153 mgd, maximum).

This maximum flow rate will be maintained for the duration of the storm, as long as the water levels in the pump chambers remain below elevation 1006 feet. At higher elevations the pressure differential across the pumps may need to be regulated by throttling their associated discharge manifold valves.

Larger storms will cause the WST to overflow at the Vicente and Lincoln Way outfall structures. This may happen an average of eight times per year when the influent flow exceeds the maximum 49.3 MG capacity of the transport. The West Box at Vicente will fill first, as the water level rises

above 990 feet. The West Box at Lincoln Way will be the last to fill, only after the storage level in the East Box were to rise an additional 16 feet to an elevation of 1006, the intermediate weir elevation.

Flow entering the Lincoln West Box will be baffled and floating debris will be retained in the East Box. Overflow onto the beach will take place only after all three storage elements are filled to elevation 1006 feet. Pumping of decanted flow to the SWOO will continue as long as the water level in the East Box remains higher than 990 feet and decanted flow continues to fill the Vicente West Box.

MODE 4: EAST SUMP OFF; WEST SUMP TO OWPCP

In the event of bar rack or pump failure in the WSS east pump chamber (#1), dry weather flow from the East Box will be diverted through the Inlet Crossover Gate, 01G7, into the west pump chamber (#2) From the west chamber, it will be pumped through the 48" force main to the OWPCP. The DCS will issue a warning message or prompt anytime when Operational Modes 3 or 2 or Automatic Mode control are initiated directly following a Mode 4 operation, i.e., without a Mode 5 operation to clean the the west sump first This message will inform the operator to initiate Mode 5 after a Mode 4 operation before using Mode 3 or 2 and before switching to Automatic Mode control.

MODE 5: CLEAN WEST SUMP

After the use of the west pump chamber (#2) for dry weather or undecanted flow (Mode 4 operation), the west sump should be cleaned before it can be used to pump decanted flow to the SWOO (Mode 3). Mode 5 is designed to use treated effluent to flush debris from the west sump (pump chamber #2). Because this mode will be used infrequently, and under varying station and weather conditions, the pump speed and sequencing controls will be operated in a Manual mode. The conditions under which Mode 5 is activated will also be left to Operations. In the case of an impending storm, the West Box may be needed for storage and immediate discharge to SWOO.

Mode 5 will align gates and valves so that flow from the West Box goes to OWPCP. Effluent pumps, 30P10–1 & –2, at OWPCP with a maximum capacity of 6 mgd (3 mgd per pump) will send treated effluent directly to the Vicente West Box. These pumps will be turned on and off and their speeds controlled manually. The Vicente West Box Flushing valve, 01V19-2, which directs the effluent flow into the Vicente Box will also be opened manually. If it becomes necessary to chlorinate the effluent, this will also be done manually. Storage in the Vicente West Box at elevation 1006 is 6.7 MG. It is unlikely that the effluent pumps will be left on long enough to fill the box.

Operations personnel will have the option of allowing effluent to collect in the Vicente West Box before sending it through the west pump chamber (#2), or opening the WST West Box Gate,

01G6–2, immediately. Dry weather flow will still be entering the station from the East Box to the east pump chamber (#1) and combining with the flow from the west pump chamber before reaching the magnetic flowmeter in the 48–inch discharge line. Flows between the pumps in the east and west pump chambers will have to be controlled and balanced manually so that the combined flow does not exceed the plant capacity. The effluent pumps at OWPCP will be manually turned off when flushing is completed.

If Mode 5 is used during a storm event, decanted flow in the West Box can be used to flush the West Chamber, before Mode 3 is used.

MODE CHANGE INTERLOCK OVERRIDE

This existing PLC function will be duplicated by the WSS DCU and will be activated only by the existing keyswitch on the WSS Control Panel.

As the station is transitioning from one operational mode to another, the DCU/DCS will constantly check the positions of all the gates and valves. If a gate or valve fails to go to the correct position within a prescribed (adjustable) time period after gate control action is commanded, the DCU will turn off any pumps that are on and alarm this condition as an 'Mode Change Interlock Failure' at the operator console(s) and the pump station alarm annunciator panel.

The 'override' function allows an operator at the WSS to override such an interlock failure. Turning the key switch (momentary contact, spring return) instructs the DCU to ignore a gate or valve out-of-position condition and continue with the pumping operation until another mode change is requested. The 'override' function will not be available at the DCS operator console(s) at OWPCP because the position of the the gate or valve must physically checked at the station before the override action is taken.

After the position malfunction problem is fixed, the alarm will be cleared and the station will resume normal operation.

PUMP CHAMBER NO. 1 (EAST)–GRINDER OPERATION

Screenings collected on bar rack #1 (01M5–1) will be brought up to the operation floor and dropped into a solids grinder (01M4). The grinder is designed to reduce all solids to a maximum size of 2–1/2–inches to prevent damage to the downstream east main lift pumps (Nos. 1, 2 & 3). The grinder will be located directly under the bar rack #1 and will include an outlet hopper, which will discharge the shredded screenings through a hole in the operating floor and return them to the waste stream in the east bar rack channel. The cutters on the grinder are designed so that the discharged screenings will be large enough to be removed by the fine bar screens in the pretreatment process at the Oceanside Plant.

The grinder will be equipped with a local control station with an overload sensing controller. Upon detection of an overload, the controller automatically stops the unit, pauses, reverses and then resumes normal operation to clear the blockage. After a predetermined number of overloads, the controller shuts off the grinder and activates a grinder 'Jam or Fail' alarm, which in turn stops the bar rack. The bar rack controls can be reset only at their local control station switch by disabling the hardwired 'grinder overload' interlock. The lift pumps will continue to operate.

When the grinder controls are in the Automatic mode, the DCU will start the grinder whenever the bar rack is in the Automatic mode and has started and will stop it 1 minute after the bar rack has stopped.

APPENDIX A

WESTSIDE PUMP STATION AND TRANSPORT

EQUIPMENT AND INSTRUMENT LOOP NUMBERS

Equipment/ Instrument Loop Nºs	New Equipment Nºs	Equipment Desc.	Existing BWPC Equipment Nºs	WSS Contract 1114W Equipment Nºs
01-1 (7)	01P1-1	Main Lift Pump #1	WS 01 P1-1	01 MSPO13-01
	01P1-2	Main Lift Pump #2	WS 01 P1-2	01 MSPO14-02
	01P1-3	Main Lift Pump #3	WS 01 P1-3	01 MSPO14-01
	01P1-4	Main Lift Pump #4	WS 01 P1-4	01 MSPO15-01
	01P1-5	Main Lift Pump #5	WS 01 P1-5	01 MSPO16-03
	01P1-6	Main Lift Pump #6	WS 01 P1-6	01 MSPO16-02
	01P1-7	Main Lift Pump #7	WS 01 P1-7	01 MSPO16-01
01-2(3)	01P2-1	Dewatering Rm Sump Pump#1	WS 001SP1	99XSP002-01
	01P2-2	Dewatering Rm Sump Pump#2	WS 001SP2	99XSP002-02
	01P2-3	Level 3 Sump Pump	WS-001SP3	99XSP001-01
01-3 (2)	01P3-1	Dewatering Pump #1	WS 01 P2-1	01DWP009-01
	01P3-2	Dewatering Pump #2	WS 01 P2-1	01DWP009-02
01-4	01M4	Grinder	---	---
01-5 (2)	01M5-1	Bar Rack #1	WS 02 M1-1	02BSC001-01
	01M5-2	Bar Rack #2	WS 02M1-2	02BSC001-01
01-6(2)	01G6-1	East Upstream Head Gate	WS01G6-1	01XSG004-01
	01G6-2	West Upstream Head Gate	WS01G6-2	01XSG003-01
01-7	01G7	Inlet Crossover Gate	WS01G7	01XSG005-01
01-8(2)	01G8-1	East Downstream Head Gate	WS01G8-1	01XSG001-01
	01G8-2	West Downstream Head Gate	WS01G8-2	01XSG002-01
01-9	LT-01-9	WST East Box Level Transmitter	FPS-1	LT-01-7
01-10	LT-01-10	WST West Box Level Transmitter	FPS-2	LT-01-6
01-11 (9)	01V11-1	Lincoln West Box Valve #1	WST Vault 4	21V4
	01V11-2	Lincoln West Box Valve #2	WST Vault 3	21V3
	01V11-3	Vicente West Box Valve #3	WST Vault 2	21V2
	01V11-4	Vicente West Box Valve #4	WST Vault1	21V1
	01V11-5	East Sump Discharge Valve	WS01V11	01KGV010-1
	01V11-6	54"SWOO Discharge Valve	WS01V12	01KGV010-2
	01V11-7	Discharge Crossover Valve	WS01V13	01KGV010-3
	01V11-8	42" RSP Discharge Valve	WS01V14	01KGV010-4
	01V11-9	48" OWPCP Discharge Valve	WS 01V15	01KGV010-5
01-12(2)	LT-01-12-1	Lincoln West Box Overflow Level		LT-21-13 (F3)
	LT-01-12-2	Lincoln West Box Level Transmitter		LT-21-14 (F4)
01-13	LSHH-01-13	Lincoln West Box Overflow Switch		To be in stalled under Clean-up
01-14	LT-01-14	Vicente West Box Level Transmitter		LT-21-15 (F5)
01-15	LS-01-15	Vicente West Box Overflow Switch		To be installed under WSS Clean-up
01-16 (2)	LT-01-16-1	East Sump Level Transmitter		LT-01-11
	LT-01-16-2	West Sump Level Transmitter		LT-01-12
	LSLL-01-16-1	East Sump Low Low Level Switch		LSL-01-16-1

	LSLL-01-16-2	West Sump Low Low Level Switch	LSL-01-16-2
01-17(2)	PT-01-17-1 PT-01-17-2	East Sump Discharge Pressure West Sump Discharge Pressure	PT-01-17-1 PT-01-17-2
01-18 (2)	01SD18-1 01SD18-2	WSS Decant Sampler WSS Overflow Sampler	
01-19 (2)	01V19-1 01V19-2	Lincoln West Box Flushing Valve Vicente West. Box Flushing Valve	To be installed
01-20	FE-01-20	54" SWOO Discharge Line Flow Meter	01MFM020-01
01-21	FE-01-21	48" OWPCP Discharge Line Flow Meter	01MFM021-01
01-22	FE-01-22	Recirculation Line Flow Meter	FE 01-08
01-23	AE-01-23	Flammable Gas Detector (VHC)	E03-1
01-24	AE-01-24	H_2S Gas Detector	AE03-21
01-25*	AE-01-25	H_2S Gas Detector– WST East Box	
01-26	AE-01-26	Oxygen Deficiency Detector	AE03-3-1
01-27(7)**	01M27-1	Water Tight Door #1	99XWD015-1
	01M27-2	Water Tight Door #2	99XWD016-1
	01M27-3	Water Tight Door #3	99XWD016-2
	01M27-4	Water Tight Door #4	99XWD016-3
	01M27-5	Water Tight Door #5	99XWD007-1
	01M27-6	Water Tight Door #6	99XWD007-2
	01M27-7	Water Tight Door #7	99XWD007-3
01-28	01SD28	SW00 Junction Box Sampler	

*New sensing element to be added to east box upstream of sluice gate
**There are 3 additional watertight doors in the catwalk area, that are not monitored by DCU.

APPENDIX B: FINAL GATE AND VALVE POSITIONS

MODE		PUMP CTRL		SLUICE GATES					VALVES					COMMENTS
		EAST	WEST	G6-1	G6-2	G7	G8-1	G8-2	V11-5	V11-6	V11-7	V11-8	V11-9	
1	EAST SUMP OFF WEST SUMP OFF	E0	W0	C	C	C	C	C	C	C	C	C	C	ALL GATES AND VALVES CLOSED AND PUMPS OFF
2	EAST SUMP TO OWPCP WEST SUMP OFF	E1	W0	OI	C	C	O	C	O	C	C	C	O	
3	EAST SUMP TO OWPCP WEST SUMP TO SWOO	E1	W2	O	O	C	O	O	O	O	C	C	O	
4	EAST SUMP OFF WEST SUMP TO OWPCP	E0	W1	O	C	O	C	O	C	C	O	C	O	
5	CLEAN WEST CHAMBER	E1	W3	OI	O	C	O	O	O	C	O	C	O	

LEGEND		
O = Open OI = Intermediate Position C = Closed E0, E1, W0, W1, W2, W3 = Pump Controls	G8-1 = East Downstream Head Gate G8-2 = West Downstream Head Gate G6-2 = West Upstream Head Gate G6-1 = East Upstream Head Gate G7 = Inlet Crossover Gate	V11-5 = East Sump Discharge Valve V11-6 = 54"SWOO Discharge Valve V11-7 = Discharge Crossover Valve V11-8 = 42" RSP Discharge Valve V11-9 = 48" OWPCP Discharge Valve

NOTE: In Mode 5, the Lincoln & Vicente fill box valves will be operated manually. They will be automatically closed in Modes 1 thru 4.

APPENDIX C: MODE TRANSITION TABLES

FROM MODE 1

		STEP	PUMP CTRL		SLUICE GATES					VALVES					COMMENTS
			EAST	WEST	G6-1	G6-2	G7	G8-1	G8-2	V11-5	V11-6	V11-7	V11-8	V11-9	
INITIAL POSITIONS		0	E0	W0	C	C	C	C	C	C	C	C	C	C	
TO MODE 2	EAST SUMP TO SWOO	1 2 3	E1	W0	OI		C	O		O		C	C	O	NOTE 4 NOTE 4
TO MODE 3	EAST SUMP TO OWPCP WEST SUMP TO SWOO	1 2 3	E1	W2	O	O	C	O	O	O	O	C	C	O	NOTE 4 NOTE 4 NOTE 3
TO MODE 4	EAST SUMP OFF WEST SUMP TO OWPCP	1 2 3	E0	W1	O	C	O	C	O	C	C	O	C	O	NOTE 4 NOTE 4 NOTE 1
TO MODE 5	CLEAN WEST CHAMBER	1 2 3	MANUAL	MANUAL	OI	O	C	O	O	O	O	C	C	O	NOTE 4 NOTE 4 NOTE 1A

NOTES:

1 Set "WEST SUMP DIRTY" flag

1A Reset "WEST SUMP DIRTY" flag after one west sump pump has been turned on for adjustable set time (Between 1 to 10 Min.).

2 Open for T1 seconds then stop .(Initial T1=30)

3 Can not change to Mode 3 if "WEST SUMP DIRTY" flag has not been reset.

4 Issue a proper command for Valves/Gates and then move to next step when valves and gates in correct position. If valves and gates do not reach correct positions within an estimated time , sound alarm and do not proceed to next step. The estimated time for valves to open and close has to be measured in the field. An initial estimate of 1 ft./sec. may be used.

5 Move to next step when power has been cut to east pumps

6 Move to next step when east manifold pressure is less than west manifold pressure

In MODE 5, the Lincoln & Vicente fill box valves will be operated manually. They will be automatically closed in Modes 1 thru 4.

FROM MODE 2 - EAST SUMP TO OWPCP, WEST SUMP OFF

		STEP	PUMP CTRL		SLUICE GATES					VALVES					COMMENTS
			EAST	WEST	G6-1	G6-2	G7	G8-1	G8-2	V11-5	V11-6	V11-7	V11-8	V11-9	
INITIAL POSITIONS		0	E1	W0	OI	C	C	O	C	O	C	C	C	O	
TO MODE 1	EAST SUMP OFF WEST SUMP OFF	1 2	E0	W0	C	C	C 	 C	 C	C	C	C	C	C	
TO MODE 3	EAST SUMP OWPCP WEST SUMP TO SWOO	1 2	E1	W2	O	 O	C	O	O		O	C	C	O	NOTE 4
TO MODE 4	EAST SUMP OFF WEST SUMP TO OWPCP	1 2 3	E0	W1	O	C 	 O	 C	O 	 C	C 	O 	C 	O 	NOTE 4 NOTE 4 & NOTE 1
TO MODE 5	CLEAN WEST CHAMBER	1 2	MANUAL	MANUAL	OI	C O	C	O	O	O	C	C	C	O	NOTE 4 NOTE 2, NOTE 6, NOTE 1A

NOTES:

1 Set "WEST SUMP DIRTY" flag

1A Reset "WEST SUMP DIRTY" flag after one west sump pump has been turned on for adjustable set time (Between 1 to 10 Min.).

2 Open for T1 seconds then stop (Initial T1=30)

3 Can not change to Mode 3 if "WEST SUMP DIRTY" flag has not been reset.

4 Issue a proper command for Valves/Gates and then move to next step when valves and gates in correct position. If valves and gates do not reach correct positions within an estimated time , sound alarm and do not proceed to next step. The estimated time for valves to open and close has to be measured in the field. An initial estimate of 1 ft./sec. may be used.

5 Move to next step when power has been cut to east pumps

6 Move to next step when east manifold pressure is less than west manifold pressure

In MODE 5, the Lincoln & Vicente fill box valves will be operated manually. They will be automatically closed in Modes 1thru 4.

FROM MODE 3 - EAST SUMP TO OWPCP, WEST SUMP TO SWOO

		STEP	PUMP CTRL		SLUICE GATES					VALVES					COMMENTS
			EAST	WEST	G6-1	G6-2	G7	G8-1	G8-2	V11-5	V11-6	V11-7	V11-8	V11-9	
INITIAL POSITIONS		0	E1	W2	O	O	C	O	O	O	O	C	C	O	
TO MODE 1	EAST SUMP OFF WEST SUMP OFF	1 2	E0	W0	C	C	C	C	C	C	C	C	C	C	
TO MODE 2	EAST SUMP TO SWWPCP WEST SUMP TO SWOO	1 2 3	E1	W0	OI	C	C	O	C		C	C	C		NOTE 4
TO MODE 4	EAST SUMP OFF WEST SUMP TO OWPCP	1 2 3	E1 E0	W1 W1	O	C	O	C	O	O	C	O	C	O	NOTE 4
CANNOT CHANGE TO MODE 5															

NOTES:

1 Set "WEST SUMP DIRTY" flag

1A Reset "WEST SUMP DIRTY" flag after one west sump pump has been turned on for adjustable set time (Between 1 to 10 Min.).

2 Open for T1 seconds then stop (Initial T1=30)

3 Can not change to Mode 3 if "WEST SUMP DIRTY" flag has not been reset.

4 Issue a proper command for Valves/Gates and then move to next step when valves and gates in correct position. If valves and gates do not reach correct positions within an estimated time , sound alarm and do not proceed to next step. The estimated time for valves to open and close has to be measured in the field. An initial estimate of 1 ft./sec. may be used.

5 Move to next step when power has been cut to east pumps

6 Move to next step when east manifold pressure is less than west manifold pressure

In MODE 5, the Lincoln & Vicente fill box valves will be operated manually. They will be automatically closed in Modes 1thru 4.

FROM MODE 4 - EAST SUMP OFF, WEST SUMP TO OWPCP

		STEP	PUMP CTRL		SLUICE GATES					VALVES					COMMENTS
			EAST	WEST	G6-1	G6-2	G7	G8-1	G8-2	V11-5	V11-6	V11-7	V11-8	V11-9	
INITIAL POSITIONS		0	E0	W1	O	C	O	C	O	C	C	O	C	O	
TO MODE 1	EAST SUMP OFF WEST SUMP OFF	1 2	E0	W0	C	C	C	C	C	C	C	C	C	C	
TO MODE 2	EAST SUMP TO OWPCP WEST SUMP OFF	1 2 3	E1	W0	OI		C	O . 	C	O		C	C		NOTE 4 NOTE 4
CAN NOT CHANGE TO MODE 3															
TO MODE 5	CLEAN WEST CHAMBER	1 2	E1	W3	OI	O	C	O	O	C	C	O	C	O	NOTE 4

NOTES:

1 Set "WEST SUMP DIRTY" flag

1A Reset "WEST SUMP DIRTY" flag after one west sump pump has been turned on for adjustable set time (Between 1 to 10 Min.).

2 Open for T1 seconds then stop (Initial T1=30)

3 Can not change to Mode 3 if "WEST SUMP DIRTY" flag has not been reset.

4 Issue a proper command for Valves/Gates and then move to next step when valves and gates in correct position. If valves and gates do not reach correct positions within an estimated time , sound alarm and do not proceed to next step. The estimated time for valves to open and close has to be measured in the field. An initial estimate of 1 ft./sec. may be used.

5 Move to next step when power has been cut to east pumps

6 Move to next step when east manifold pressure is less than west manifold pressure

In MODE 5, the Lincoln & Vicente fill box valves will be operated manually. They will be automatically closed in Modes 1thru 4.

FROM MODE 5 - CLEAN WEST CHAMBER

		STEP	PUMP CTRL		SLUICE GATES					VALVES					COMMENTS
			EAST	WEST	G6-1	G6-2	G7	G8-1	G8-2	V11-5	V11-6	V11-7	V11-8	V11-9	
INITIAL POSITIONS		0	E1	W3	O	O	C	O	O	O	C	O	C	O	
TO MODE 1	EAST SUMP OFF WEST SUMP OFF	1 2	E0	W0	C	C	C	C	C	C	C	C	C	C	
TO MODE 2	EAST SUMP TO OWPCP WEST SUMP OFF	1 2	E1	W0	OI	C	C	O	C	O	C	C	C	O	NOTE 4
TO MODE 3	EAST SUMP TO OWPCP WEST SUMP TO SWOO	1 2	E1	W2	O	O		O	O	O	O	C	C	O	NOTE 4
TO MODE 4	EAST SUMP OFF WEST SUMP TP OWPCP	1 2	E0	W1	O	C	O	C	O	O	C	O	C	O	NOTE 4

NOTES:

1 Set "WEST SUMP DIRTY" flag

1A Reset "WEST SUMP DIRTY" flag after one west sump pump has been turned on for adjustable set time (Between 1 to 10 Min.).

2 Open for T1 seconds then stop (Initial T1=30)

3 Can not change to Mode 3 if "WEST SUMP DIRTY" flag has not been reset.

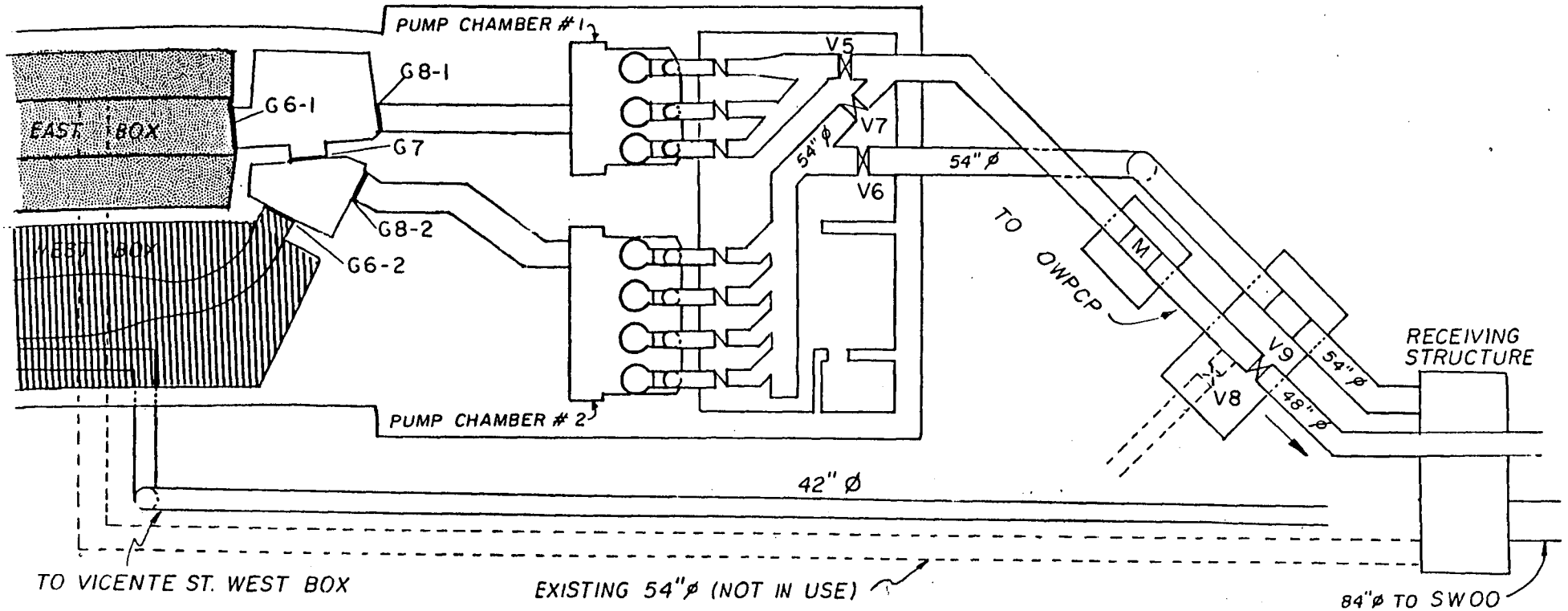
4 Issue a proper command for Valves/Gates and then move to next step when valves and gates in correct position. If valves and gates do not reach correct positions within an estimated time , sound alarm and do not proceed to next step. The estimated time for valves to open and close has to be measured in the field. An initial estimate of 1 ft./sec. may be used.

5 Move to next step when power has been cut to east pumps

6 Move to next step when east manifold pressure is less than west manifold pressure

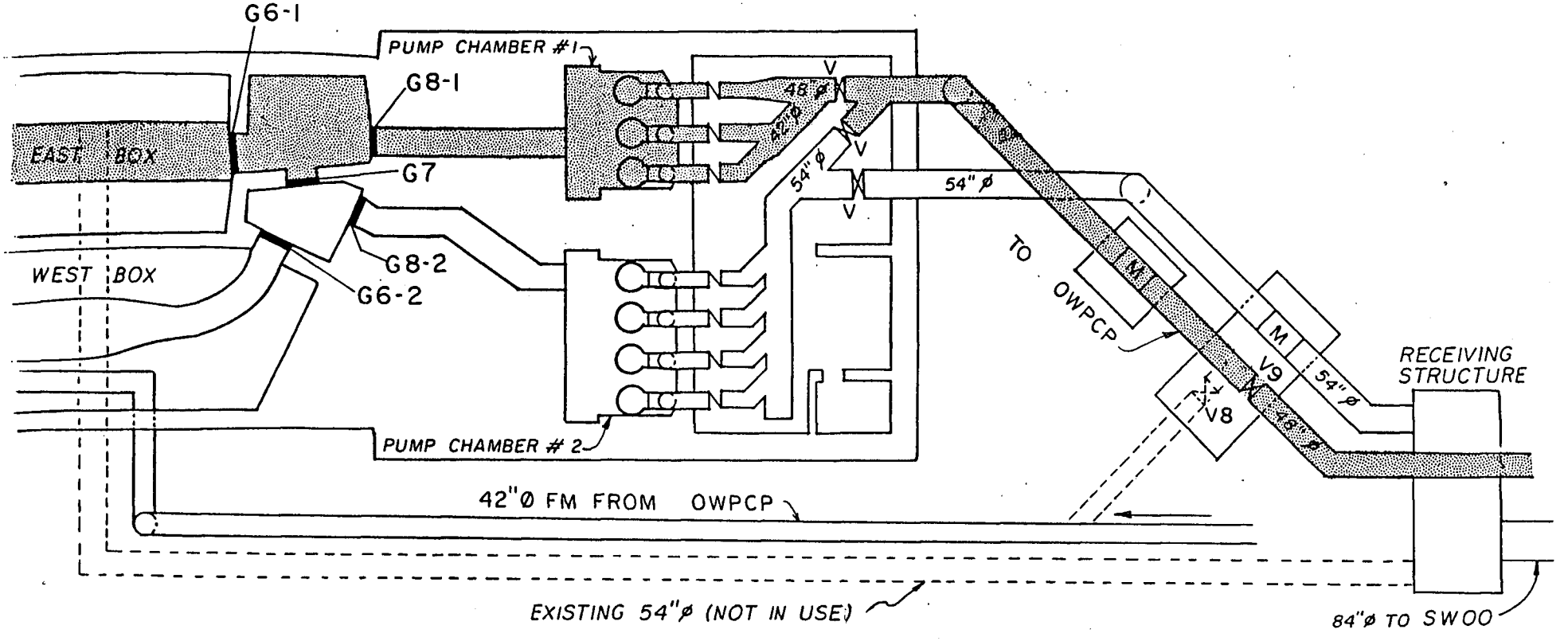
In MODE 5, the Lincoln & Vicente fill box valves will be operated manually. They will be automatically closed in Modes 1thru 4.

APPENDIX D: MODE SCHEMATICS

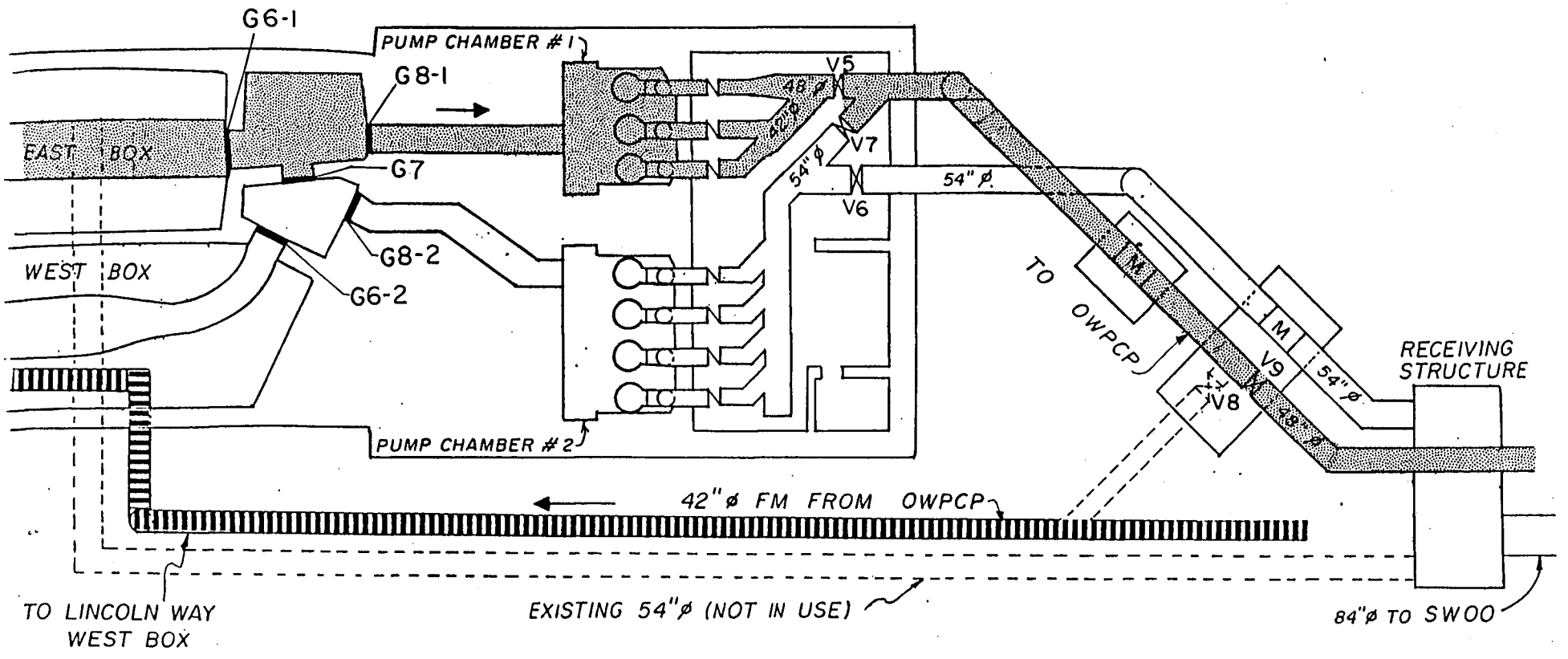


MODE I. OFF

PUMPS ARE OFF. GATES AND VALVES ARE CLOSED

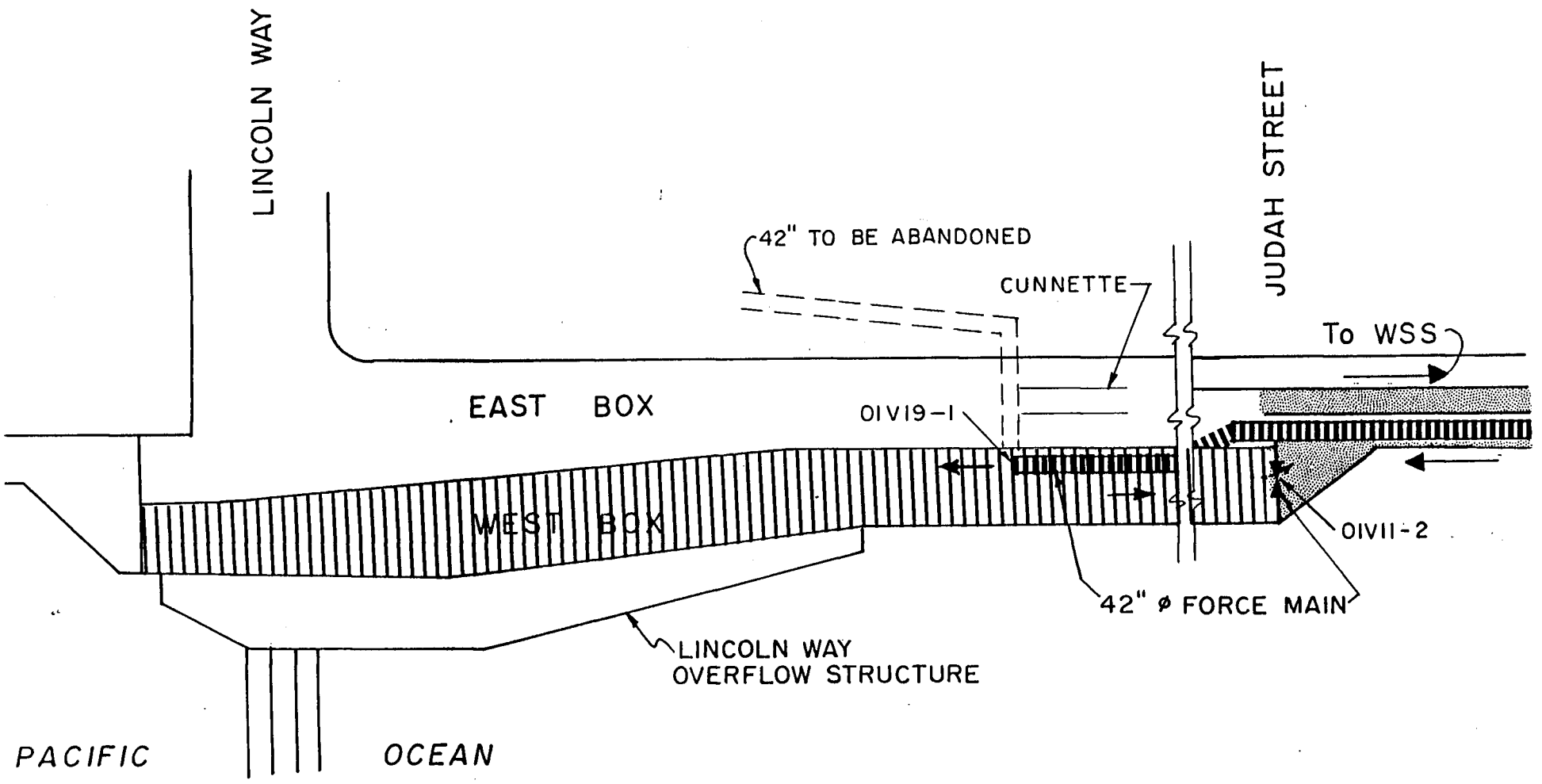


MODE 2-EAST SUMP TO OWPCP. WEST SUMP OFF
WESTSIDE INFLUENT BY GRAVITY TO WSPS
PUMP CHAMBER # 1. THEN PUMPED BY 48" FM
TO OWPCP.



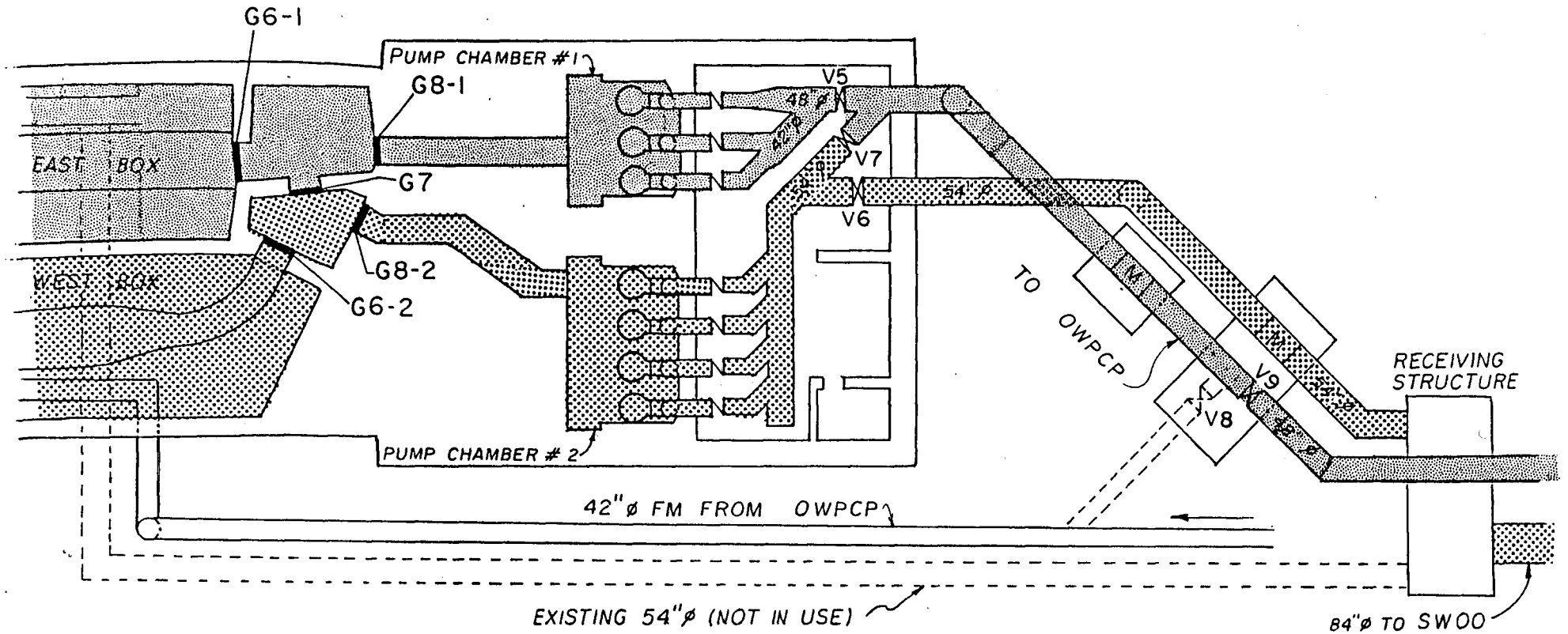
FILL LINCOLN WEST BOX

OWPCP EFFLUENT PUMPED TO LINCOLN WAY WEST BOX VIA 42" FM.
EAST BOX EFFLUENT FLUSHING TO PUMP CHAMBER # 1 TO OWPCP.



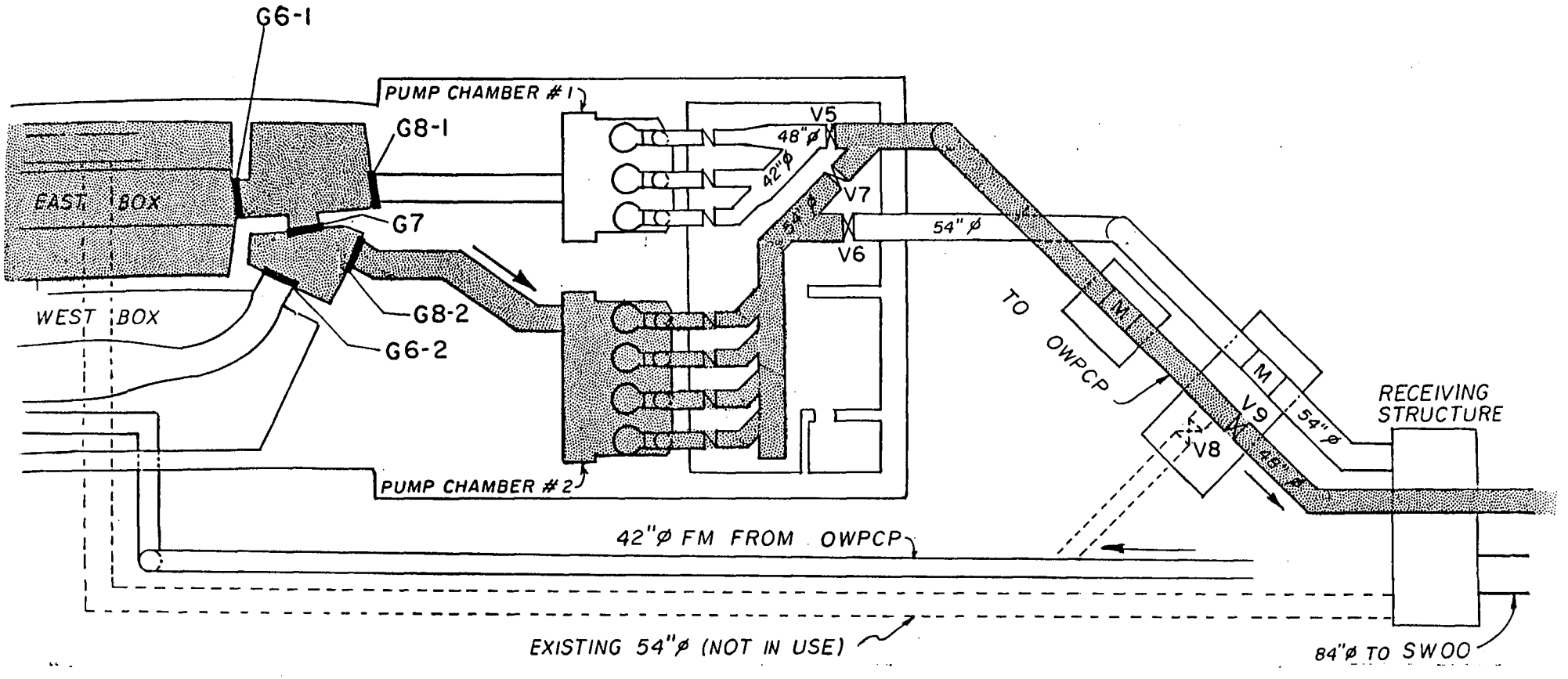
FILL LINCOLN WEST BOX

OWPCP EFFLUENT PUMPED TO LINCOLN WAY BOX VIA 42" FORCE MAIN.
EAST BOX EFFLUENT FLUSHING TO PUMP CHAMBER # 1 TO OWPCP.



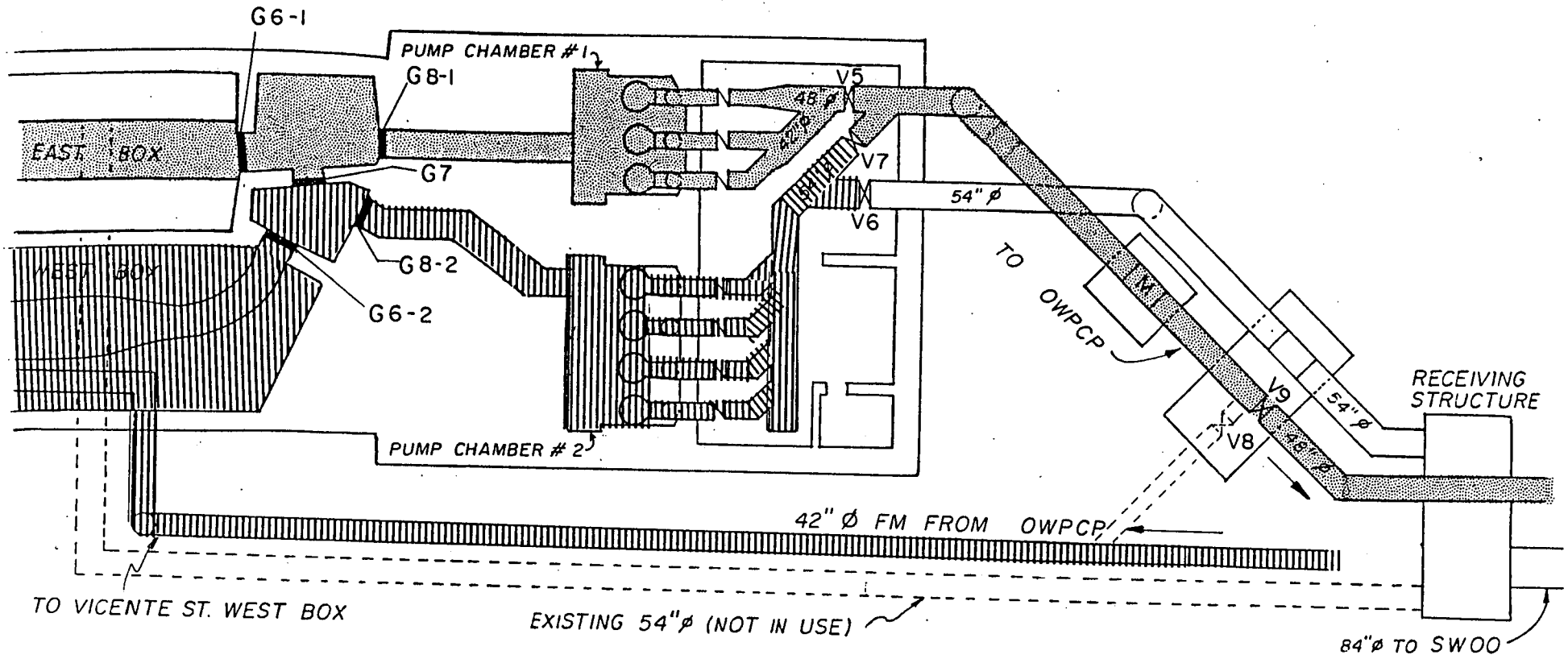
MODE 3.-EAST SUMP TO OWPCP, WEST SUMP TO SWOO

WW FLOW IN EAST BOX TO PUMP CHAMBER # 1 TO OWPCP
DECANTED WW FLOW IN WEST BOX TO PUMP CHAMBER # 2 TO SWOO



MODE 4. - EAST SUMP OFF. WEST SUMP TO OWPCP

WESTSIDE INFLUENT BY GRAVITY TO WSPS, THRU CROSSOVER GATE TO PUMP CHAMBER # 2.
THEN PUMPED BY 48" FM TO OWPCP.



MODE 5.-CLEAN WEST CHAMBER

OWPCP EFFLUENT PUMPED TO VICENTE ST. WEST BOX VIA 42" FM. PUMPED BY WEST SUMP BACK TO OWPCP BEFORE NORMAL OPERATION CAN RESUME

APPENDIX E

Valve Throttling - Main Lift Pumps 01P1-1 thru 01P1-7

01V11-5 and 01V11-6 shall throttle when differential pressure varies during the pumping operation. The DCU shall command the throttling operation, do all calculations and check valve positions according to the following:

For 0IVII-5

1. P_1 - Pressure in 48-inch manifold - Pressure in Chamber #1
2. Calculate ΔP_1 every 1 minute when $48 \leq P_1 \leq 50$;
3. Calculate ΔP_1 every 1 second when $\Delta P_1 > 50$ or $\Delta P_1 < 48$;
4. If $\Delta P_1 > 52$ and valve is not fully open, then start opening valve;
5. When $\Delta P_1 \leq 50$ or valve is fully open, then stop valve opening;
6. If $\Delta P_1 \leq 48$, then start closing valve; when $\Delta P_1 > 48$, then stop valve closure.

For 0IVII-6

1. P_2 - Pressure in 54-inch manifold - Pressure in Chamber #2
2. Calculate ΔP_2 every 1 minute when $7 \leq P_2 \leq 9$;
3. Calculate ΔP_2 every 1 second when $\Delta P_2 > 9$ or $\Delta P_2 < 7$;
4. If $\Delta P_2 > 9$ and valve is not fully open, then start opening valve
5. When $\Delta P_2 < 7$ then start closing valve;
6. If $\Delta P_2 \geq 7$, stop valve closure; when $\Delta P_2 \leq 9$ or valve is fully open, stop valve opening.

APPENDIX F

WSS PUMP MAXIMUM FLOW CONTROL

Control of the main lift pumps (01P1-1 thru 01P1-7) to the OSP is determined by the sump level with the "MAXIMUM FLOW TO OSP" signal limiting the maximum flow at all times.

The maximum rate of flow change is 7 MGD increase per 15 min. but the reduction can be from 65 to 0 MGD in less than one minute. Because of this restriction, after a power failure and all pumps stop, the OSP will not receive 65 MGD until approximately 2 hours and 20 minutes have elapsed.

A method of controlling the main lift pumps in modes 2, 3, and 4 follows (in mode 1, pumps are off; in mode 5 pumps are controlled manually):

I. Set up a level register, LR, to control the pumps according to the control sequences E1, W1, W2, and W3. This register is used for control and does not hold the actual sump level. This register can have a different value than the sump level.

II. Let:

   A. the Maximum flow requested by the Ocean Side Plant = "OSP"

   B. the actual flow, FIT-01-21, being pumped from the Westside Station to the Oceanside Plant = "WSS"

   C. the sump level of the sump which is pumping to the Ocean Side Plant = "SL"

III. Write a routine to perform the following:

   A. Set "LR" = 965.9 for startup and on power failure

      1. If "OSP" = 0 then shut down pump station (END)

      2. If "WSS-OSP"$\leq$"|Z|", wait for time "T1.1" (END) else

3. If "OSP" < "WSS" (pump less) else

   a. if "WSS-OSP"≤5, then reduce "LR" by a value "X1" and wait for time "T1.1" (END) else

   b if 5<"WSS-OSP"≤10, then reduce "LR" by a value "X2" and wait for time "T1.2" (END) else

   c. if 10<"WSS-OSP"≤20, then reduce "LR" by a value "X3" and wait for time "T1.3" (END) else

   d. if 20<"WSS-OSP"≤30, then reduce "LR" by a value "X4" and wait for time "T1.4" (END) else

   e. if 30<"WSS-OSP", then reduce "LR" by a value "X5" and wait for time "T1.5" (END) (note: do not reduce "LR" lower than 965.9)

4. If "OSP" > "WSS", then (pump more)

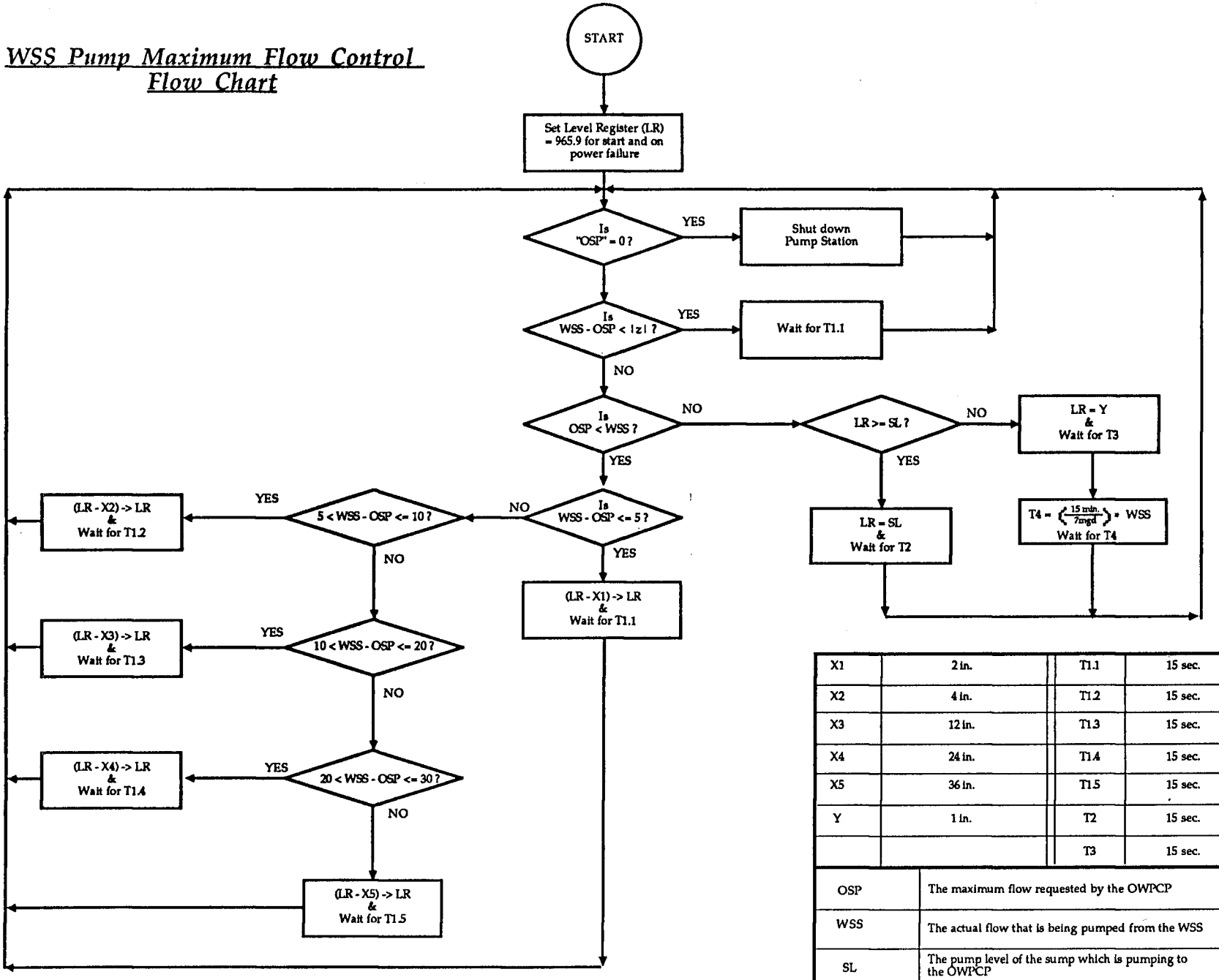
   a. If "LR" ≥ "SL", then set "LR" = "SL" and wait for time "T2" (END) else

   b. If "LR" < "SL", then increase "LR" by "Y"
      i. wait for time "T3"
      ii. wait for time "T4" = $(\frac{15 \text{ min.}}{7 \text{ mgd}})$*"WSS" (END) note: "WSS" is in mgd units

All variables are initial values and shall be adjustable based on field conditions. Initial values for the variables are as follows:

X1 = 2 in.
T1.1 = 15 sec.
X2 = 4
T1.2 = 15 sec.
X3 = 12 in.
T1.3 = 15 sec.
X4 = 24
T1.4 = 15 sec.
X5 = 36
T1.5 = 15 sec.
T2 = 15 sec.
Y = 1 in.
T3 = 15 sec.
Z = 2 mgd

WSS Pump Maximum Flow Control Flow Chart



X1	2 in.	T1.1	15 sec.
X2	4 in.	T1.2	15 sec.
X3	12 in.	T1.3	15 sec.
X4	24 in.	T1.4	15 sec.
X5	36 in.	T1.5	15 sec.
Y	1 in.	T2	15 sec.
		T3	15 sec.

OSP	The maximum flow requested by the OWPCP
WSS	The actual flow that is being pumped from the WSS
SL	The pump level of the sump which is pumping to the OWPCP

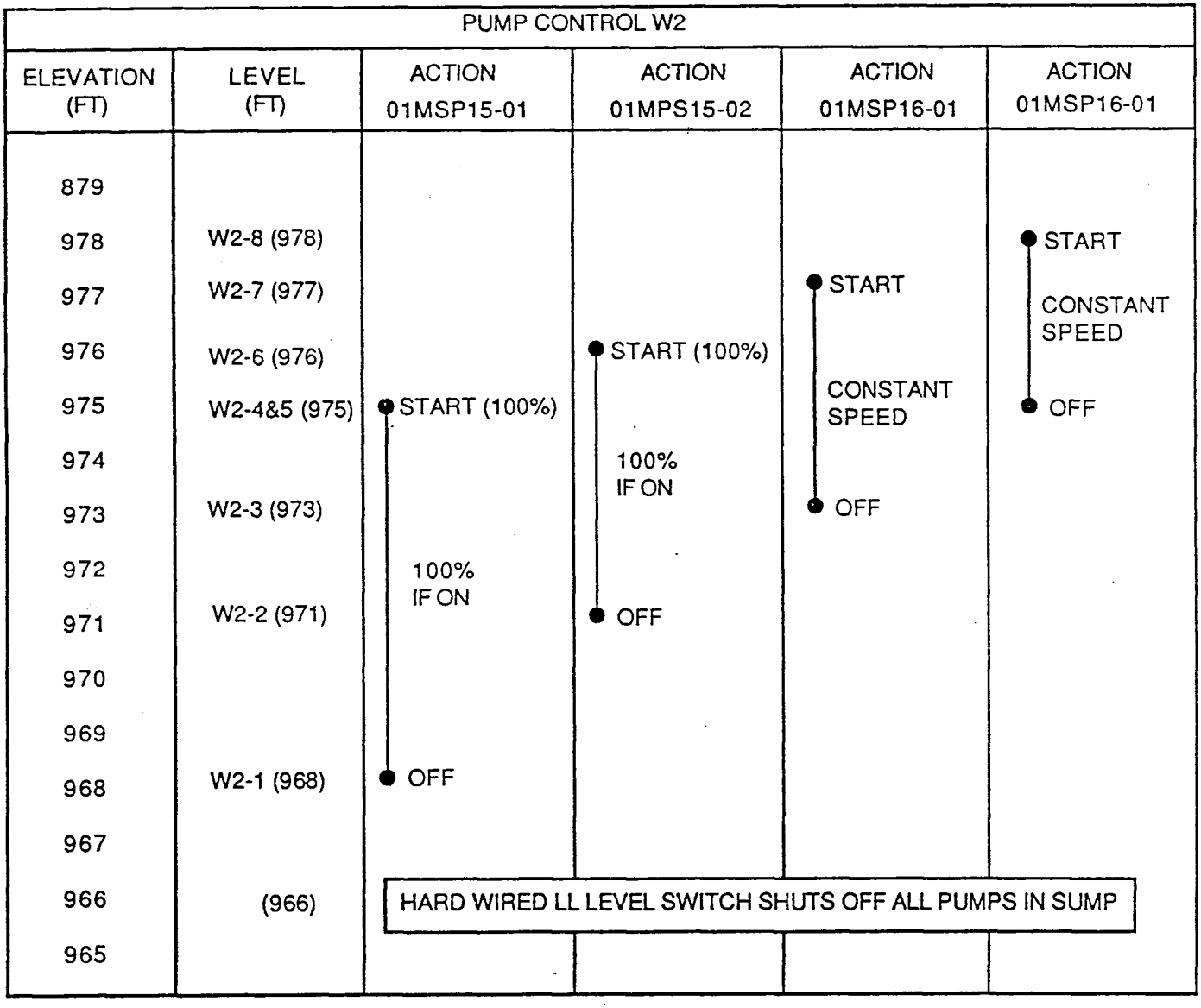
APPENDIX G: PUMP CONTROL TABLES

PUMP CONTROL E1					
ELEVATION (FT)	LEVEL (FT)	ACTION 01MSP13-01	ACTION 01MPS13-02	ACTION 01MSP13-03	
879					
978					
977					
976					
975	E1-7 (975)	100%	100%	100%	
974					
973	E1-6 (973.5)	70%	70%	70%	
972	E1-5 (972.5)	100%	100%	OFF	
971	E1-4 (971)	60%	60%		
970	E1-3 (970)	100%	OFF		
969					
968	E1-2 (968)	50%			
967	E1-1 (967)	OFF			
966	966	HARD WIRED LL LEVEL SWITCH SHUTS OFF ALL PUMPS IN SUMP			
965					

USED UNDER NORMAL CONDITIONS TO PUMP DW
FLOW FROM EAST SUMP TO OCEANSIDE WPCP

PUMP CONTROL W1					
ELEVATION (FT)	LEVEL (FT)	ACTION 01MSP15-01	ACTION 01MPS15-02		
879					
978					
977					
976					
975					
974					
973					
	W1-5 (972.5)	100%	100%		
972					
971	W1-4 (971)	60%	60%		
970	W1-3 (970)	100%	OFF		
969					
968	W1-2 (968)	50%			
967	W1-1 (967)	OFF			
966	(966)	HARD WIRED LL LEVEL SWITCH SHUTS OFF ALL PUMPS IN SUMP			
965					

USED DURING DW TO PUMP FROM WEST SUMP TO OCEANSIDE WPCP



USED TO PUMP DECANTED FROM WEST SUMP TO SWOO

PUMP CONTROL W3					
ELEVATION (FT)	LEVEL (FT)	ACTION 01MSP15-01			
879					
978					
977					
976					
975					
974					
973					
972	W3-5 (972.5)	100%	100%		
971	W3-4 (971)	60%	60%		
970	W3-3 (970)	100%	OFF		
969					
968	W3-2 (968)	50%			
967	W3-1 (967)	OFF			
966	(966)	HARD WIRED LL LEVEL SWITCH SHUTS OFF ALL PUMPS IN SUMP			
965					

APPENDIX H

Loop Descriptions for Westside Pump Station and Transport P & I D's

NOTE: Also refer to the "WESTSIDE PUMP STATION AND TRANSPORT OPERATION" description.

LOOP 01-1

a. Function

ON/OFF/AUTO selection at local motor drives, Central Graphic Panel (CGP) and DCS for main lift pumps 01P1-1 thru 01P1-7 controls. Pump RUNNING status indication at Central Graphic Panel (CGP) and DCS. AUTO (Computer)/MANUAL speed control mode indication at CGP and at DCS and COMPUTER/MANUAL speed control selection at local motor drives, CGP and DCS for pumps 01P1-1 thru 01P1-3, 01P1-4 and 01P1-6. Pump FAIL or LEAK alarm signal to annunciator system and DCS. Under AUTO mode and COMPUTER speed control selection, the pumps respond to DCU ON/OFF and SPEED commands. Low level shut down interlocks for pumps 01P1-1 thru 01P1-3 with LSL-01-16-1. Low level shut down interlocks for pumps 01P1-4 thru 01P1-7 with LSL-01-16-2.

b. Components

SS-01-1-1 (OOA)	Selector switch, 3 positions
SIHK-01-1-1 (CM)	Computer/Manual speed controller
QL-01-1-1-1 (ON)	Indicating light, single
QL-01-1-1-2 (AM)	Indicating lights, 2 singles
QA-01-1-1 (LEAK OR FAIL)	Annunciator point
SS-01-1-2 (OOA)	Selector switch, 3 positions
SIHK-01-1-2 (CM)	Computer/Manual speed controller
QL-01-1-2-1 (ON)	Indicating light, single
QL-01-1-2-2 (AM)	Indicating lights, 2 singles
QA-01-1-2 (LEAK OR FAIL)	Annunciator point
SS-01-1-3 (OOA)	Selector switch, 3 positions
SIHK-01-1-3 (CM)	Computer/Manual speed controller
QL-01-1-3-1 (ON)	Indicating light, single
QL-01-1-3-2 (AM)	Indicating lights, 2 singles
QA-01-1-3 (LEAK OR FAIL)	Annunciator point
SS-01-1-4 (OOA)	Selector switch, 3 positions
SIHK-01-1-4 (CM)	Computer/Manual speed controller

QL-01-1-4-1 (ON)	Indicating light, single
QL-01-1-4-2 (AM)	Indicating lights, 2 singles
QA-01-1-4 (LEAK OR FAIL)	Annunciator point
SS-01-1-5 (OOA)	Selector switch, 3 positions
QL-01-1-5 (ON)	Indicating light, single
QA-01-1-5 (LEAK OR FAIL)	Annunciator point
SS-01-1-6 (OOA)	Selector switch, 3 positions
SIHK-01-1-6 (CM)	Computer/Manual speed controller
QL-01-1-6-1 (ON)	Indicating light, single
QL-01-1-6-2 (AM)	Indicating lights, 2 singles
QA-01-1-6 (LEAK OR FAIL)	Annunciator point
SS-01-1-7 (OOA)	Selector switch, 3 positions
QL-01-1-7 (ON)	Indicating light, single
QA-01-1-7 (LEAK OR FAIL)	Annunciator point

LOOP 01-2

a. Function

HAND/OFF/AUTO selection at local control panel for dewatering room sump pumps 01P2-1 and 01P2-2 and level 3 sump pump 01P2-3. Local ON/OFF indicator light and ON light at Central Graphic Panel. In Auto pumps are controlled by local sump level switches and relays in R&T Panel. Sump HIGH /LOW level alarm at Annunciator Panel and DCS.

b. Components

SS-01-2-1 (HOA)	Selector switch, 3 positions
QL-01-2-1-1 (OO)	Indicating lights, 2 singles
QL-01-2-1-2 (ON)	Indicating lights, 1 single
LSH/L-01-2-1 (LSH/L)	Level switches, float type
LAH/L-01-2-1 (LSH/L)	Annunciator point
SS-01-2-2 (HOA)	Selector switch, 3 positions
QL-01-2-2-1 (OO)	Indicating lights, 2 singles
QL-01-2-2-2 (ON)	Indicating lights, 1 single
SS-01-2-3 (HOA)	Selector switch, 3 positions
QL-01-2-3-1 (OO)	Indicating lights, 2 singles
QL-01-2-3-2 (ON)	Indicating lights, 1 single
LSH/L-01-2-3 (LSH/L)	Level switches, float type
LAH/L-01-2-3 (LSH/L)	Annunciator point

LOOP 01-3

a. Function

ON/OFF and LOCAL/REMOTE selection for dewatering pumps 01P3-1 and 01P3-2 at local control panel. Pump ON status indicated locally and at Central Graphic Panel and LOCAL control status indicated at CGP. No DCS Functions.

b. Components

SS-01-3-1 (LR)	Selector switch, 2 positions
HS-01-3-1 (OO)	Pushbuttons, momentary
QL-10-3-1-1 (ON)	Indicating light, single
QL-01-3-1-2 (ON)	Indicating light, single
QL-01-3-1-3(LOCAL)	Indicating light, single
SS-01-3-2 (LR)	Selector switch, 2 positions
HS-01-3-2 (OO)	Pushbuttons, momentary
QL-01-3-2-1 (ON)	Indicating light, single
QL-01-3-2-2 (ON)	Indicating light, single
QL-01-3-1-3 (LOCAL)	Indicating light, single

LOOP 01-4

a. Function

ON/OFF/AUTO selection for screenings grinder, 01M4, at the Central Graphic Panel (CGP). AUTO control at DCS and LOCAL status indication at CGP. GRINDER JAM OR FAILED alarm at Annunciator Panel and DCS. ON/OFF status indication at CGP and DCS. In auto mode the DCU operates the grinder when bar rack 01M5-1 is on and in AUTO and if the grinder jams and alarms, bar rack will shut off.

b. Components

SS-01-4 (OOA)	Selector switch, 2 positions
QL-01-4-1 (OO)	Indicating lights, 2 singles
QL-01-4-2 (LOCAL)	Indicating lights, single
QA-01-4-1 (JAM OR FAIL)	Annunciator point

LOOP 01-5

a. Function

OFF/AUTO control for mechanical bar racks OIM5-1 and OIM5-2 at Central Graphic Panel (CGP). BROKEN SHEAR PIN alarmed at Annunciator Panel and DCS. ON/OFF status indication at CGP and DCS and AUTO control status indication at DCS. In AUTO mode, the DCS operates the bar rack through separate, adjustable On/Off timers (0 to 60 minutes range) The 'permission to run' signal comes from Loop 01-8-1 for 01M5-1 and Loop 01-8-2 for 01M5-2 When the differential level across a bar rack is high (adjustable setpoint), the bar rack shall operate regardless of the regular timer cycle through a separate DCU Off-Delay timer (0 to 10 minutes). Differential indicator at CGP. Differential level

indicator at Central Bubbltrol Panel High level differential signal to DCU. ON/OFF/REMOTE selector switch at local. LOCAL control mode indicator at CGP. Also see Loop 01-4 for interlock with grinder 01M4.

b. Components

SS-01-5-1 (OA)	Selector switch, 2 positions
QL-01-5-1-1 (OO)	Indicating lights, 2 singles
QL-01-5-1-2 (LOCAL)	Indicating lights, single
QA-01-5-1 (Broken Shear Pin)	Annunciator point
LDI-01-5-1-1	Indicator, panel mounting
LDI-01-5-1-2	Indicator, panel mounting
LDS-01-5-1	Differential level switch
LDT-01-5-1	Differential level transmitter
SS-01-5-2 (OA)	Selector switch, 2 positions
QL-01-5-2-1 (OO)	Indicating lights, 2 singles
Q1-01-5-2-2 (LOCAL)	Indicating lights, single
QA-01-5-2 (Broken Shear Pin)	Annunciator point
LDI-01-5-2-1	Indicator, panel mounting
LDI-01-5-2-2	Indicator, panel mounting
LDS-01-5-2	Differential level switch
LDT-01-5-2	Differential level transmitter

LOOP 01-6

a. Function

Momentary contact OPEN/STOP/CLOSE control of the Upstream Head gates 01G6-1 and 01G6-2 at the gate operator. Momentary contact OPEN/STOP/CLOSE control at Central Graphic Panel and DCS. OPEN/CLOSED status indication at the gate operator, DCS and at the Central Graphic Panel. LOCAL/REMOTE selection at the gate operator. AUTO/MANUAL mode selection at the CGP and DCS. AUTO mode indication at the DCS. Indication of a position INTERLOCK FAILURE alarm during a mode transition at CGP and DCS. Also has interlock function with Loop O1–5.

b. Components

HS-01-6-1-1 (OSC)	Pushbuttons, momentary
HS-01-6-1-2 (OSC)	Pushbuttons, momentary
ZL-01-6-1-1 (OC)	Indicating lights, 2 singles
ZL-01-6-1-2 (OC)	Indicating lights, 2 singles
SS-01-6-1-1 (LR)	Selector Switch, 2 positions
SS-01-6-1-2 (MA)	Selector Switch, 2 positions
ZAL-01-6-1(INTERLOCK FAILURE)	Position alarm light, 1 single

HS-01-6-2-1 (OSC)	Pushbuttons, momentary
HS-01-6-2-2 (OSC)	Pushbuttons, momentary
ZL-01-6-2-1 (OC)	Indicating lights, 2 singles
ZL-01-6-2-2 (OC)	Indicating lights, 2 singles
SS-01-6-2-1 (LR)	Selector Switch, 2 positions
SS-01-6-2-2 (MA)	Selector Switch, 2 positions
ZAL-01-6-2 (INTERLOCK FAILURE)	Position alarm light, 1 single

LOOP 01-7

a. Function

Same as Loop 01-6 except for Inlet Crossover gate, 01G7, and no interlock function with Loop 01–5.

b. Components

HS-01-7-1-1 (OSC)	Pushbuttons, momentary
HS-01-7-1-2 (OSC)	Pushbuttons, momentary
ZL-01-7-1-1 (OC)	Indicating lights, 2 singles
ZL-01-7-1-2 (OC)	Indicating lights, 2 singles
SS-01-7-1-1 (LR)	Selector Switch, 2 positions
SS-01-7-1-2 (MA)	Selector Switch, 2 positions
ZAL-01-7 (INTERLOCK FAILURE)	Position alarm light, 1 single

LOOP 01-8

a. Function

Momentary contacts OPEN/STOP/CLOSE control of the East and West Downstream Head gates, 01G8-1 and 01G8-2, at the gate operator. Momentary contact OPEN/STOP/CLOSE control at Central Graphic Panel and DCS. OPEN/CLOSED status indication at the gate operator and OPEN/INTERMEDIATE/CLOSED status at Central Graphic Panel and DCS. Indication of a position 'interlock failure' alarm during a mode transition at CGP and DCS. Hardwired interlock at R&T panel with watertight doors so that when any watertight doors for the associated bar rack channel and pump chamber are not fully closed, the gate cannot be opened. The gates will still be able to be closed at any time. Hardwired interlock at R&T Panel when a gate starts to open (or is not fully closed) to permit associated mechanical bar rack AUTO operation. For 01G8-1 only, DCS control for throttling gate to intermediate position during dry weather (Mode 2) operation.

b. Components

HS-01-8-1-1 (OSC)	Pushbuttons, momentary
HS-01-8-1-2 (OSC)	Pushbuttons, momentary
ZL-01-8-1-1 (OC)	Indicating lights, 2 singles
ZL-01-8-1-2 (OIC)	Indicating lights, 3 singles
SS-01-8-1-1 (LR)	Selector Switch, 2 positions
SS-01-8-1-2 (MA)	Selector Switch, 2 positions

ZAL-01-8-1(Interlock Failure)	Position alarm light, 1 single
HS-01-8-2-1 (OSC)	Pushbuttons, momentary
HS-01-8-2-2 (OC)	Pushbuttons, momentary
ZL-01-8-2-1 (OC)	Indicating lights, 2 singles
ZL-01-8-2-2 (OIC)	Indicating lights, 3 singles
SS-01-8-2-1 (LR)	Selector Switch, 2 singles
SS-01-8-2-2 (MA)	Selector Switch, 2 singles
ZAL-01-8-2 (Interlock Failure)	Position alarm light, 1 single

LOOP 01-9

a. Function

WST east box level monitor. Level indication on Central Graphic Panel, on DCS, and on Central Bubbltrol Panel. See Functional Descriptions for DCS level control functions. Also see Loop 01-33.

b. Components

LT-01-9	Level Transmitter, electronic Unit range: 40 ft. of water
LI-01-9-1 LI-01-9-2	Indicators, panel mounting, Scale range: 0 to 40 ft. ??

LOOP 01-10

a. Function

WST west box level monitor. Level indication on Central Graphic Panel, on DCS, and on Central Bubbltrol Panel. See Functional Descriptions for DCS level control functions. Also see Loop 01-33.

b. Components

LT-01-10	Level Transmitter, electronic Unit range: 40 ft. of water
LI-01-10-1 LI-01-10-2	Indicators, panel mounting, Scale range: 0- 40 ft.

LOOP 01-11

a. Function

LOCAL/REMOTE selection control and OPEN/STOP/CLOSE control locally for WST valves 01V11-1, 01V11-2, 01V11-3 and 01V11-4. OPEN/STOP/CLOSE momentary control at DCS. OPEN/CLOSED status indication at Local and DCS. REMOTE mode indication at DCS.

LOCAL/REMOTE selection control, OPEN/STOP/CLOSE momentary control and OPEN/CLOSED status and POSITION indication locally for WSS discharge valves 01V11-5 thru 01V11-9 at the valve operators. MANUAL/AUTO selection control,

OPEN/CLOSED status indication, and OPEN/STOP/CLOSE momentary controls at Central Graphic Panel. MANUAL/AUTO selection control, AUTO mode indication, and OPEN/STOP/CLOSE momentary controls at DCS. Indication of a position 'interlock failure' alarm during a mode transition at CGP and DCS. For 01V11-5 and 01V11-6, POSITION indication at Central Graphic Panel and DCS and OPENING/CLOSING status inputs to DCS for throttling control. Under AUTO mode, the DCU controls the gates operation and pushbuttons at Central Graphic Panel shall have no effect. For 01V11-5 and 01V11-6, see also Loop 01-17 for DCU inputs on throttling control which will be enabled only after the valves have reached the full open position.

b. Components

HS-01-11-1-1 (OSC)	Pushbuttons, momentary
HS-01-11-1-2 (OSC)	DCS pushbuttons, momentary
SS-01-11-1-3 (LR)	Selector switch, 2 positions
ZL-01-11-1-1 (OSC)	Indicating lights, 3 singles
ZL-01-11-1-2 (OSC)	DCS indications
QL-01-11-1-1 (R)	DCS indication
HS-01-11-2-1 (OSC)	Pushbuttons, momentary
HS-01-11-2-2 (OSC)	DCS pushbuttons, momentary
SS-01-11-2-3 (LR)	Selector switch, 2 positions
ZL-01-11-2-1 (OSC)	Indicating lights, 3 singles
ZL-01-11-2-2 (OSC)	DCS indications
QL-01-11-2-1 (R)	DCS indication
HS-01-11-3-1 (OSC)	Pushbuttons, momentary
HS-01-11-3-2 (OSC)	DCS pushbuttons, momentary
SS-01-11-3-3 (LR)	Selector switch, 2 positions
ZL-01-11-3-1 (OSC)	Indicating lights, 3 singles
ZL-01-11-3-2 (OSC)	DCS indications
QL-01-11-3-1 (R)	DCS indication
HS-01-11-4-1 (OSC)	Pushbuttons, momentary
HS-01-11-4-2 (OSC)	DCS pushbuttons, momentary
SS-01-11-4-3 (LR)	Selector switch, 2 positions
ZL-01-11-4-1 (OSC)	Indicating lights, 3 singles
ZL-01-11-4-2 (OSC)	DCS indications
QL-01-11-4-1 (R)	DCS indication
SS-01-11-5-1 (LR)	Selector switch, 2 positions
SS-01-11-5-2 (MA)	Selector switch, 2 positions
HS-01-11-5-1 (OSC)	Pushbuttons, momentary
HS-01-11-5-2 (OSC)	Pushbuttons, momentary

ZL-01-11-5-1 (OC)	Indicating lights, 2 singles
ZL-01-11-5-2 (OC)	Indicating lights, 2 singles
ZI-01-11-5	Position indicator, 0 to 100 %
ZS-01-11-5 (opening/closing)	DCU discrete inputs (2)
ZAL-01-11-5 (Interlock Failure)	Position alarm light, 1 single
SS-01-11-6-1 (LR)	Selector switch, 2 positions
SS-01-11-6-2 (MA)	Selector switch, 2 positions
HS-01-11-6-1 (OSC)	Pushbuttons, momentary
HS-01-11-6-2 (OSC)	Pushbuttons, momentary
ZL-01-11-6-1 (OC)	Indicating lights, 2 singles
ZL-01-11-6-2 (OC)	Indicating lights, 2 singles
ZI-01-11-6	Position indicator, 0 to 100 %
ZS-01-11-6 (opening/closing)	DCU discrete inputs (2)
ZAL-01-11-6 (Interlock Failure)	Position alarm light, 1 single
SS-01-11-7-1 (LR)	Selector switch, 2 positions
SS-01-11-7-2 (MA)	Selector switch, 2 positions
HS-01-11-7-1 (OSC)	Pushbuttons, momentary
HS-01-11-7-2 (OSC)	Pushbuttons, momentary
ZL-01-11-7-1 (OC)	Indicating lights, 2 singles
ZL-01-11-7-2 (OC)	Indicating lights, 2 singles
ZAL-01-11-7 (Interlock Failure)	Position alarm light, 1 single
SS-01-11-8-1 (LR)	Selector switch, 2 positions
SS-01-11-8-2 (MA)	Selector switch, 2 positions
HS-01-11-8-1 (OSC)	Pushbuttons, momentary
HS-01-11-8-2 (OSC)	Pushbuttons, momentary
ZL-01-11-8-1 (OC)	Indicating lights, 2 singles
ZL-01-11-8-2 (OC)	Indicating lights, 2 singles
ZAL-01-11-8 (Interlock Failure)	Position alarm light, 1 single
SS-01-11-9-1 (LR)	Selector switch, 2 positions
SS-01-11-9-2 (MA)	Selector switch, 2 positions
HS-01-11-9-1 (OSC)	Pushbuttons, momentary
HS-01-11-9-2 (OSC)	Pushbuttons, momentary
ZL-01-11-9-1 (OC)	Indicating lights, 2 singles
ZL-01-11-9-2 (OC)	Indicating lights, 2 singles
ZAL-01-11-9 (Interlock Failure)	Position alarm light, 1 single

LOOP 01-12

a. Function

Level monitor at West Box (Lincoln Way) overflow weir (LT-01-12-1) to determine depth of water over weir at time of overflow event. Level monitor at West Box invert (LT-01-12-2). Continuous level indications at DCS.

b. Components

LT-01-12-1	Level transmitter, electronic
LI-01-12-1	DCS level indicator
LT-01-12-2	Level transmitter, electronic
LI-01-12-2	DCS level indicator

LOOP 01-13

a. Function

Level switch monitors water level on west side of overflow weir to identify any overflow events through the Lincoln West Box outfall structure. Overflow event is alarmed at the Annunciator Panel and the DCS. Sampler 01SD18-2 in WSS is activated by the DCU upon alarm for the duration of the overflow event. See also Loop 01-18.

b. Components

LSHH-01-13	Level Switch
LAHH-01-13-1	DCS level alarm - OVERFLOW
LAHH-01-13-2	Level alarm - OVERFLOW

LOOP 01-14

a. Function

Level monitor at West Box (Vicente Street) overflow weir (LT-01-14-1) to detect any overflow and determine depth of water over weir during overflow event. Continuous level indication at DCS. Level is recorder by chart recorder in WSS control room

b. Components

LT-01-14	Level transmitter
LI-01-14	DCS level indicator
LR-01-14	Level recorder, circular chart type

LOOP 01-15

a. Function

Level switch monitors water level on west side of overflow weir to identify any overflow events through the Vicente West Box outfall structure. Overflow event is alarmed at the Annunciator Panel and the DCS. Sampler 01SD18-2 in WSS is activated by the DCU upon alarm for the duration of the overflow event.

b. Components

LSHH-01-15	Level Switch
LAHH-01-15-1	DCS level alarm - OVERFLOW
LAHH-01-15-2	Level alarm - OVERFLOW

LOOP 01-16

a. Function

Level monitors at Pump Chambers No. 1 (East sump) and No. 2 (West sump). Level indicators at Central Graphic Panel, at Central Bubbltrol Panel and at DCS. Level signals to DCU for main pumps control and throttling control of valves 01V11-5 and 01V11-6 (also see Loop 01-17). Detect low-low levels in pump chambers No. 1 and No. 2 and activate low-low level switch to shut down all main pumps in respective chamber. Low-ow level alarms at Annunciator panel and DCS.

b. Components

LT-01-16-1	Level transmitter, electronic, unit range: 0 to 60 ft. of water
LI-01-16-1-1	Indicators, panel mounting
LI-01-16-1-2	Scale range: 0 to 60 ft. of water
LSLL-01-16-1	Level switch, current trip, contact open at El. -34.0 and below
LALL-01-16-1	Annunciator point
LT-01-16-2	Level transmitter, electronic, unit range: 0 to 60 ft. of water
LI-01-16-2-1	Indicators, panel mounting
LI-01-16-2-2	Scale range: 0 to 60 ft. of water
LSLL-01-16-2	Level switch, current trip, contact open at El. -34.0 and below
LALL-01-16-2	Annunciator point

LOOP 01-17

a. Function

Discharge pressure at manifolds of pump chambers No. 1 and No. 2 indications at Central Graphic Panel and DCS. Pressure signals used by DCU-8 for throttling control of valves 01V11-5 and 01V11-6 (also see Loop 01-16).

b. Components

PT-01-17-1	Pressure transmitter, electronics
PT-01-17-2	Units range: 0-40 FT. of water
PI-01-17-1-1	Pressure indicator, panel mounting
PI-01-17-2-1	Pressure indicator, panel mounting

LOOP 01-18

a. Function

Sample decanted flow from Pump Chamber No. 2 discharge manifold. Sampler 01SD18-1 is activated by DCU maintained discrete output when any pumps in the West Chamber are on and the discharge crossover valve 01V11-7 is closed. Sampling interval is based on a local timer within the sampler.

Sample decanted flow from Pump Chamber No. 2 discharge manifold during overflow events. Overflow events detected by level switches LSHH-01-13 (Lincoln West Box) or LSHH-01-15 (Vicente West Box). Sampler 01SD18-2 is activated by DCU maintained discrete output when pumps in the West Chamber are on, discharge crossover valve 01V11-7 is closed and either LSHH-01-13 or LSHH-01-15 have tripped. Sampling interval is based on a local timer within the sampler.

LOOP 01-19

a. Function

LOCAL/REMOTE selection control and OPEN/CLOSE local control for Lincoln and Vicente Box Flushing valves, 01V19-1 and 01V19-2. OPEN/CLOSE control at DCS. OPEN/CLOSED indication locally and at DCS. REMOTE control mode indication at DCS.

b. Components

SS-01-19-1-1 (OC)	Selector switch, 2 positions
SS-01-19-1-2 (OC)	DCS switch, 2 positions
SS-01-19-1-3 (LR)	Selector switch, 2 positions
ZL-01-19-1-1 (OC)	Indicating lights, 2 singles
ZL-01-19-1-2 (OC)	DCS indications
QL-01-19-1 (R)	DCS indication
SS-01-19-2-1 (OC)	Selector switch, 2 positions
SS-01-19-2-2 (OC)	DCS switch, 2 positions
SS-01-19-2-3 (LR)	Selector switch, 2 positions
ZL-01-19-2-1 (OC)	Indicating lights, 2 singles
ZL-01-19-2-2 (OC)	DCS indications
QL-01-19-2 (R)	DCS indication

LOOP 01-20

a. Function

Flow measurement through the magnetic flow meter 01FE20 in the 54 inch discharge line to SWOO Flow indication at local panel, Central Graphic Panel and DCS.

b. Components

FIT-01-20	Flow indicator transmitter, electronics, Range: 0 to 100 MGD
FI-01-20	Indicator, panel mounting, Range: 0 to 100 MGD

LOOP 01-21

a. Function

Flow measurement through the magnetic flow meter 01FE21 in the 48 inch discharge line to OWPCP. Flow indication at local panel, Central Graphic Panel and DCS.

b. Components

FIT-01-21	Flow indicator transmitter, electronics, Range: 0 -100 MGD
FI-01-21	Indicator, panel mounting, Range: 0 -100 MGD

LOOP 01-22

a. Function

Flow measurement through the magnetic flow meter 01FE22 in the recirculation line. Flow indication at local panel and Central Graphic Panel.

b. Components

FIT-01-22	Flow indicator transmitter, electronics, Range: 0 to 25 MGD
FI-01-22	Indicator, panel mounting, Scale Range: 0 to 25 MGD

LOOP 01-23 ? STATON SHUTDOWN INTERLOCK W/ GATES AND PUMPS ??

a. Function

Monitor the air in the exhaust air duct for the presence of volatile hydrocarbons. When concentration reaches the first alarm level (20% LEL), an alarm is registered at annunciator panel and DCS.

b. Components

AE-01-23	Sensing elements and transmitter
AISH-01-23-1	Switch, 20% LEL
AAH-01-23-1 (2) (VHC)	Annunciator points

LOOP 01-24

a. Function

Monitor the air in the exhaust air duct for the presence of hydrogen sulfide gas. When concentration reaches the alarm level, start the carbon absorber unit and register an alarm at the Annunciator Panel and the DCS.

b. Components

AE-01-24	Sensing elements and transmitter
AISH-01-24	Switch, current set points adjustable
AAH-01-24 (H_2S)	Annunciator point

LOOP 01-25

a. Function

Monitor the air in the east box upstream of head gate 01G8-1 for the presence of hydrogen sulfide gas. When concentration reaches the alarm level, start the carbon absorber unit and register an alarm at the Annunciator Panel and the DCS.

b. Components

AE-01-25	Sensing elements and transmitter
AISH-01-25	Switch, current set points adjustable
AAH-01-25 (H_2S)	Annunciator point

LOOP 01-26

a. Function

Monitor the air in the exhaust air duct for oxygen difficiency. When it reaches the alarm level (adjustable) an alarm is registered on the Annunciator panel and through the DCU-8 to DCS at OWPCP.

b. Components

AE-01-26	Sensing elements and transmitter
AISL-01-26	Switch, current set points adjustable
AAL-01-26 (-O_2)	Annunciator point

LOOP 01-27

a. Function

Monitor the position of seven watertight doors in the WSS. Doors to be monitored are 01M27-1 in station inlet structure, 01M27-2, -3 and -4 in the west bar rack channel and 017-5, -6 and -7 in the east channel. When any of the three doors,01M27-5, -6, or -7, in the east channel are open, gate 01G8-2 will not open. When any of the three doors, 01M27-2, -3 or -4, in the west channel are open, gate 01G8-2 will not open. Open door condition alarmed at the annunciator panel and the DCS.

b. Components

ZS-01-27-1	Position (Limit) switch
ZA-01-27-1	Open Position Alarm
ZS-01-27-2	Position (Limit) switch
ZA-01-27-2	Open Position Alarm
ZS-01-27-3	Position (Limit) switch
ZA-01-27-3	Open Position Alarm
ZS-01-27-4	Position (Limit) switch
ZA-01-27-4	Open Position Alarm
ZS-01-27-5	Position (Limit) switch
ZA-01-27-5	Open Position Alarm
ZS-01-27-6	Position (Limit) switch
ZA-01-27-6	Open Position Alarm
ZS-01-27-7	Position (Limit) switch
ZA-01-27-7	Open Position Alarm

LOOP 01-28

a. Function

Flow-pace samples of all wet weather discharges out the SWOO. Sampler 01SD28 in the sampling station adjacent to the SWOO Junction Structure is activated by DCU maintained discrete output. When pumps in the West Chamber are on, valve 01V11-7 is closed and valve 01V11-8 is not closed, the flow signal registered on flow meter FE-01-20 will be added to the effluent flow signal from OWPCP (FE-30-3) to establish the total flow out to SWOO. Sampler 01SD28 will take flow-paced samples based on that total flow.

LOOP 01-30

a. Function

MANUAL/MANUAL ASSIST/AUTOMATIC remote control mode selection at the CGP. MANUAL enables the individual equipment switches on the Central Graphic Panel (CGP). MANUAL ASSIST enables the Operational Mode selection pushbuttons on the CGP–see Loop 01-31. AUTOMATIC transfer control to the DCS operator consoles. Remote control mode indications at DCS.

b. Components

SS-01-30 (M/MA/A)	Selector switch, 3 positions

LOOP 01-31

a. Function

MODE1 THROUGH MODE 5 operational mode selection at Central Graphic Panel (CGP) and at DCS. When SS-01-30, see above, is in MANUAL ASSIST control mode, then selection of any one of the station's 5 operational modes can be made from the CGP through the use of the 5 operational mode pushbuttons. When SS-01-30 is in AUTO and the equivalent DCS software switch is in MANUAL ASSIST, then selection of any one of the station's 5 operational modes can be made from the DCS operator console through the use of the 5 equivalent DCS operational mode pushbuttons. At annunciator panel and DCS, alarm any 'operational mode change (transition) interlock failure' whenever a valve or gate fails to go to the proper position (within a set time period) during a mode change in the AUTO or MANUAL ASSIST remote control modes.

b. Components

HS-01-31-1 (MODE 1)	Pushbutton, momentary
HS-01-31-2 (MODE 2)	Pushbutton, momentary
HS-01-31-3 (MODE 3)	Pushbutton, momentary
HS-01-31-4 (MODE 4)	Pushbutton, momentary
HS-01-31-5 (MODE 5)	Pushbutton, momentary
QL-01-31-1 (MODE 1)	Indicating light, 1 single
QL-01-31-2 (MODE 2)	Indicating light, 1 single
QL-01-31-3 (MODE 3)	Indicating light, 1 single

QL-01-31-4 (MODE 4)	Indicating light, 1 single
QL-01-31-5 (MODE 5)	Indicating light, 1 single
QA-01-31(Interlock Failure)	Annunciator point

LOOP 01-32

a. Function

AUTO/MANUAL selection for Maximum Flow signal input at CGP. MANUAL allows entry of Maximum Flow signal value (8 to 65MGD) from the GCP manual loading station. AUTO allows entry of flow value from the DCS operator console(s). AUTO/MANUAL control status indication at DCS.

b. Components

FIHK-01-32 (AM–MAX FLOW)	Flow indicating manual loading station

LOOP 01-33

a. Function

Recording of level signals for the WST East Box, LT-01-9, and Vicente West Box, LT-01-10, at control panel in WSS control room.

b. Components

LR-01-33	Level recorder, circular chart type

LOOP 01-34

a. Function

Recording of flow signals for the 54-inch discharge line to SWOO, FIT-01-20, and the 48-inch discharge line to OWPCP, FIT-01-21, at control panel in WSS control room..

b. Components

FR-01-34	Flow recorder, circular chart type

01-34

Could show EX or NEW WSS Interface will all points

APPENDIX I: WESTSIDE SYSTEM INPUT/OUTPUT POINT LIST

I/O Address

No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
1	AI	ST-01-1-1	Main Lift Pump #1 Speed New	Speed	0-100%	01-1-1	WSS
2	AI	ST-01-1-2	Main Lift Pump #2 Speed	Speed	0-100%	01-1-2	WSS
3	AI	ST-01-1-3	Main Lift Pump #3 Speed (ex)	Speed	0-100%	01-1-3	WSS
4	AI	ST-01-1-4	Main Lift Pump #4 Speed	Speed	0-100%	01-1-4	WSS
5	AI	ST-01-1-6	Main Lift Pump #6 Speed New	Speed	0-100%	01-1-6	WSS
6	AI	LT-01-9	WST East Box Level	LEVEL	0-40FT	01-9	WSS
7	AI	LT-01-10	WST West Box Level	LEVEL	0-40FT	01-10	WSS
8	AI	ZT-01-11-5	East Sump Discharge Valve Position	POSITION	0-100%	01-11	WSS
9	AI	ZT-01-11-6	54" SWOO Discharge Valve Position	POSITION	0-100%	01-11	WSS
10	AI	LT-01-12-1	Lincoln West Box Level	LEVEL		01-12	WSS
11	AI	LT-01-12-2	Lincoln West Box Level	LEVEL		01-12	WSS
12	AI	LT-01-14	Vicente West Box Level	LEVEL		01-14	WSS
13	AI	LT-01-16-1	Pump Chamber #1 ~~Water~~ Level	LEVEL	0-60FT	01-16	WSS
14	AI	LT-01-16-2	Pump Chamber #2 ~~Water~~ Level	LEVEL	0-60FT	01-16	WSS
15	AI	PT-01-17-1	Discharge Pressure (Pump Chamber #1)	PRESSURE	0-140FT	01-17	WSS
16	AI	PT-01-17-2	Discharge Pressure (Pump Chamber #2)	PRESSURE	0-140FT	01-17	WSS
17	AI	FIT--01-20	48" Discharge LineFlow Meter	FLOW	0-100MGD	01-20	WSS
18	AI	FIT-01-21	54" Discharge Line Flow Meter	FLOW	0-100MGD	01-21	WSS
19	AI	FIT-01-22	Recirculation Line Flow Meter	FLOW	0-25MGD	01-22	WSS

	No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
1	~~20~~	AO	01P1-1	**Main Lift Pump #1 Speed Control Output**	Speed Control	0-100%	01-1	WSS
2	~~21~~	AO	01P1-2	**Main Lift Pump #2 Speed Control Output**	Speed Control	0-100%	01-1	WSS
3	~~22~~	AO	01P1-3	**Main Lift Pump #3 Speed Control Output**	Speed Control	0-100%	01-1	WSS
4	~~23~~	AO	01P1-4	**Main Lift Pump #4 Speed Control Output**	Speed Control	0-100%	01-1	WSS
5	~~24~~	AO	01P1-6	**Main Lift Pump #6 Speed Control Output**	Speed Control	0-100%	01-1	WSS
6	25	AO	01SD28	**SWOO Junction Box Sampler**	SAMPLE		01-28	WSS

No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
26	DI	SS-01-1-1	Main Lift Pump #1 Auto Sequence	AUTO (ON/OFF)	-	01-1	WSS
27	DI	SIHK-01-1-1	Main Lift Pump #1 Auto Speed	AUTO (Speed Control)	-	01-1	WSS
28	DI	QAS-01-1-1	Main Lift Pump #1 Fail or Leak Alarm	FAIL or LEAK	-	01-1	WSS
29	DI	QS-01-1-1-1	Main Lift Pump #1 Running	RUNNING	-	01-1	WSS
30	DI	SS-01-1-2	Main Lift Pump #2 Auto Sequence	AUTO (ON/OFF)	-	01-1	WSS
31	DI	SIHK-01-1-2	Main Lift Pump #2 Auto Speed	AUTO (Speed Control)	-	01-1	WSS
32	DI	QAS-01-1-2	Main Lift Pump #2 Fail or Leak Alarm	FAIL or LEAK	-	01-1	WSS
33	DI	QS-01-1-2-1	Main Lift Pump #2 Running	RUNNING	-	01-1	WSS
34	DI	SS-01-1-3	Main Lift Pump #3 Auto Sequence	AUTO (ON/OFF)	-	01-1	WSS
35	DI	SIHK-01-1-3	Main Lift Pump #3 Auto Speed	AUTO (Speed Control)	-	01-1	WSS
36	DI	QAS-01-1-3	Main Lift Pump #3 Fail or Leak Alarm	FAIL or LEAK	-	01-1	WSS
37	DI	QS-01-1-3-1	Main Lift Pump #3 Running	RUNNING	-	01-1	WSS
38	DI	SS-01-1-4	Main Lift Pump #4 Auto Sequence	AUTO (ON/OFF)	-	01-1	WSS
39	DI	SIHK-01-1-4	Main Lift Pump #4 Auto Speed	AUTO (Speed Control)	-	01-1	WSS
40	DI	QAS-01-1-4	Main Lift Pump #4 Fail or Leak Alarm	FAIL or LEAK	-	01-1	WSS
41	DI	QS-01-1-4-1	Main Lift Pump #4 Running	RUNNING	-	01-1	WSS
42	DI	SS-01-1-5	Main Lift Pump #5 Auto Sequence	AUTO (ON/OFF)	-	01-1	WSS
43	DI	QAS-01-1-5	Main Lift Pump #5 Fail or Leak Alarm	FAIL or LEAK	-	01-1	WSS
44	DI	QS-01-1-5-1	Main Lift Pump #5 Running	RUNNING	-	01-1	WSS
45	DI	SS-01-1-6	Main Lift Pump #6 Auto Sequence	AUTO (ON/OFF)	-	01-1	WSS
46	DI	SIHK-01-1-6	Main Lift Pump #6 Auto Speed	AUTO (Speed Control)	-	01-1	WSS
47	DI	QAS-01-1-6	Main Lift Pump #6 Fail or Leak Alarm	FAIL or LEAK	-	01-1	WSS
48	DI	QS-01-1-6-1	Main Lift Pump #6 Running	RUNNING	-	01-1	WSS
49	DI	SS-01-1-7	Main Lift Pump #7 Auto Sequence	AUTO (ON/OFF)	-	01-1	WSS
50	DI	QAS-01-1-7	Main Lift Pump #7 Fail or Leak Alarm	FAIL or LEAK	-	01-1	WSS
51	DI	QS-01-1-7-1	Main Lift Pump #7 Running	RUNNING	-	01-1	WSS
52	DI	SS-01-4	Grinder Auto Mode	AUTO	-	01-4	WSS
53	DI	QAS-01-4-1	Grinder Fail Alarm	FAIL	-	01-4	WSS
54	DI	QS-01-4-1	Grinder On	ON	-	01-4	WSS
55	DI	QS-01-4-1	Grinder Off	OFF	-	01-4	WSS
56	DI	01M5-1	Bar Rack #1 AUTO and Inlet Gate is not fully closed		-	01-5	WSS
57	DI	SS-01-5-1	Bar Rack #1 Auto Mode	AUTO	-	01-5	WSS

No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
58	DI	LDS-01-5-2-1	Bar Rack #1 Differential Level High	HIGH	-	01-5	WSS
59	DI	QAS-01-5-1	Bar Rack #1 Shear Pin Broken Alarm	PIN BROKEN	-	01-5	WSS
60	DI	QS-01-5-1-1	Bar Rack #1 Running	RUNNING	-	01-5	WSS
61	DI	01M5-2	Bar Rack #2 AUTO and Inlet Gate is not fully closed		-	01-5	WSS
62	DI	SS-01-5-2	Bar Rack #2 Auto Mode	AUTO	-	01-5	WSS
63	DI	LDS-01-5-2-2	Bar Rack #2 Differential Level High	HIGH	-	01-5	WSS
64	DI	QAS-01-5-2	Bar Rack #2 Shear Pin Broken Alarm	PIN BROKEN	-	01-5	WSS
65	DI	QS-01-5-2-1	Bar Rack #2 Running	RUNNING	-	01-5	WSS
66	DI	SS-01-6-1-2	East Upstream Head Gate Auto Mode	AUTO	-	01-6	WST
67	DI	ZS-01-6-1	East Upstream Head Gate Closed Limit Switch	FULLY CLOSED	-	01-6	WST
68	DI	ZS-01-6-1	East Upstream Head Gate Open Limit Switch	FULLY OPENED	-	01-6	WST
69	DI	SS-01-6-2-2	West Upstream Head Gate Auto Mode	AUTO	-	01-6	WST
70	DI	ZS-01-6-2	West Upstream Head Gate Closed Limit Switch	FULLY CLOSED	-	01-6	WST
71	DI	ZS-01-6-2	West Upstream Head Gate Open Limit Switch	FULLY OPENED	-	01-6	WST
72	DI	SS-01-7-1-2	Inlet Crossover Gate Auto Mode	AUTO	-	01-7	WSS
73	DI	ZS-01-7-1-1	Inlet Crossover Gate Closed Limit Switch	FULLY CLOSED	-	01-7	WSS
74	DI	ZS-01-7-1-1	Inlet Crossover Gate Open Limit Switch	FULLY OPENED	-	01-7	WSS
75	DI	SS-01-8-1-2	East Downstream Head Gate Auto Mode	AUTO	-	01-8	WSS
76	DI	ZS-01-8-1-2	East Downstream Head Gate Closed Limit Switch	FULLY CLOSED	-	01-8	WSS
77	DI	ZS-01-8-1-2	East Downstream Head Gate Intermediate Limit Switch	INTERMEDIATE		01-8	WSS
78	DI	ZS-01-8-1-2	East Downstream Head Gate Open Limit Switch	FULLY OPENED	-	01-8	WSS
79	DI	SS-01-8-2-2	West Downstream Head Gate Auto Mode	AUTO	-	01-8	WSS
80	DI	ZS-01-8-2-2	West Downstream Head Gate Closed Limit Switch	FULLY CLOSED	-	01-8	WSS
81	DI	ZS-01-8-2-2	West Downstream Head Gate Open Limit Switch	FULLY OPENED	-	01-8	WSS
82	DI	ZS-01-11-1-2	Lincoln West Box Valve #1 Open Limit Switch	OPEN	-	01-11	WST
83	DI	ZS-01-11-1-2	Lincoln West Box Valve #1 Closed Limit Switch	CLOSED	-	01-11	WST
84	DI	SS-01-11-1-3	Lincoln West Box Valve #1 Remote Mode	REMOTE	-	01-11	WST
85	DI	ZS-01-11-2-2	Lincoln West Box Valve #2 Open Limit Switch	OPEN	-	01-11	WST
86	DI	ZS-01-11-2-2	Lincoln West Box Valve #2 Closed Limit Switch	CLOSED	-	01-11	WST
87	DI	SS-01-11-2-3	Lincoln West Box Valve #2 Remote Mode	REMOTE	-	01-11	WST
88	DI	ZS-01-11-3-2	Lincoln West Box Valve #3 Open Limit Switch	OPEN	-	01-11	WST
89	DI	ZS-01-11-3-2	Lincoln West Box Valve #3 Closed Limit Switch	CLOSE	-	01-11	WST

No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
90	DI	SS-01-11-3-3	Lincoln West Box Valve #3 Remote Mode	REMOTE	-	01-11	WST
91	DI	ZS-01-11-4-2	Lincoln West Box Valve #4 Open Limit Switch	OPEN	-	01-11	WST
92	DI	ZS-01-11-4-2	Lincoln West Box Valve #4 Closed Limit Switch	CLOSE	-	01-11	WST
93	DI	SS-01-11-4-3	Lincoln West Box Valve #4 Remote Mode	REMOTE	-	01-11	WST
94	DI	SS-01-11-5-2	East Sump Discharge Valve Auto Mode	AUTO	-	01-11	WSS
95	DI	ZS-01-11-5	East Sump Discharge Valve Opening	OPENING		01-11	WSS
96	DI	ZS-01-11-5	East Sump Discharge Valve Closing	CLOSING	-	01-11	WSS
97	DI	ZS-01-11-5-2	East Sump Discharge Valve Closed Limit Switch	FULLY CLOSED	-	01-11	WSS
98	DI	ZS-01-11-5-2	East Sump Discharge Valve Open Limit Switch	FULLY OPENED	-	01-11	WSS
99	DI	SS-01-11-6-2	54" SWOO Discharge Valve Auto Mode	AUTO	-	01-11	WSS
100	DI	ZS-01-11-6	54" SWOO Discharge Valve Opening	OPENING		01-11	WSS
101	DI	ZS-01-11-6	54" SWOO Discharge Valve Closing	CLOSING	-	01-11	WSS
102	DI	ZS-01-11-6-2	54" SWOO Discharge Valve Closed Limit Switch	FULLY CLOSED	-	01-11	WSS
103	DI	ZS-01-11-6-2	54" SWOO Discharge Valve Open Limit Switch	FULLY OPENED	-	01-11	WSS
104	DI	SS-01-11-7-2	Discharge Crossover Valve Auto Mode	AUTO	-	01-11	WSS
105	DI	ZS-01-11-7-2	Discharge Crossover Valve Closed Limit Switch	FULLY CLOSED	-	01-11	WSS
106	DI	ZS-01-11-7-2	Discharge Crossover Valve Open Limit Switch	FULLY OPENED	-	01-11	WSS
107	DI	SS-01-11-8-2	42" RSP Discharge Valve Auto Mode	AUTO	-	01-11	WSS
108	DI	ZS-01-11-8-2	42" RSP Discharge Valve Open Limit Switch	FULLY OPENED	-	01-11	WSS
109	DI	ZS-01-11-8-2	42" RSP Discharge Valve Closed Limit Switch	FULLY CLOSED	-	01-11	WSS
110	DI	SS-01-11-9-2	48" OWPCP Discharge Valve Auto Mode	AUTO	-	01-11	WSS
111	DI	ZS-01-11-9-2	48" OWPCP Discharge Valve Open Limit Switch	FULLY OPENED	-	01-11	WSS
112	DI	ZS-01-11-9-2	48" OWPCP Discharge Valve Closed Limit Switch	FULLY CLOSED	-	01-11	WSS
113	DI	LT-01-12-1	Lincoln West Box Overflow Level Switch	High	-	01-12	WSS
114	DI	LSHH-01-13	Lincoln West Box Overflow Level Switch	High - High	-	01-13	WSS
115	DI	LSHH-01-15	Vicente West Box Overflow Level Switch	High - High	-	01-15	WSS
116	DI	ZS-01-19-1-2	Lincoln West Box Flushing Valve Open Limit Switch	OPEN	-	01-19	WST
117	DI	ZS-01-19-1-2	Lincoln West Box Flushing Valve Closed Limit Switch	CLOSED	-	01-19	WST
118	DI	SS-01-19-1-3	Lincoln West Box Flushing Valve Remote Mode	REMOTE	-	01-19	WST
119	DI	ZS-01-19-2-2	Vicente West Box Flushing Valve Open Limit Switch	OPEN	-	01-19	WST
120	DI	ZS-01-19-2-2	Vicente West Box Flushing Valve Closed Limit Switch	CLOSED	-	01-19	WST
121	DI	AE-01-23	Flammable Gas Detector High	High	-	01-23	WSS

No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
122	DI	AE-01-24	H2S Gas Detector High	High	-	01-24	WSS
123	DI	AE-01-25	H2S Gas Detector (East Box) High	High	-	01-25	WSS
124	DI	AE-01-26	Oxygen Deficency Detector Low	Low	-	01-26	WSS
125	DI	ZS-01-27-1	Watertight Doors #1 is opened (01M27-1)	OPEN	-	01-27	WSS
126	DI	ZS-01-27-2(3)	Watertight Doors #2,3,4 is opened (01M27-2,3,4)	OPEN	-	01-27	WSS
127	DI	ZS-01-27-5(3)	Watertight Doors #5,6,7 is opened (01M27-5,6,7)	OPEN	-	01-27	WSS
129	DI	SS-01-30M	Control Mode Selection Switch	MANUAL	-	01-30	WSS
130	DI	SS-01-30MA	Control Mode Selection Switch	MANUAL ASSIS.	-	01-30	WSS
131	DI	HS-01-31-1	WSS Operational Mode 1 Pushbutton	MODE 1	-	01-31	WSS
132	DI	HS-01-31-2	WSS Operational Mode 2 Pushbutton	MODE 2	-	01-31	WSS
133	DI	HS-01-31-3	WSS Operational Mode 3 Pushbutton	MODE 3	-	01-31	WSS
134	DI	HS-01-31-4	WSS Operational Mode 4 Pushbutton	MODE 4	-	01-31	WSS
135	DI	HS-01-31-5	WSS Operational Mode 5 Pushbutton	MODE 5	-	01-31	WSS
136	DI	HS-01-31-6	Mode Change Interlock Override	OVERRIDE	-	01-31	WSS
137	DI	FIHK-01-32	Maximum Westside Flow Signal	MAXIMUM	-	01-32	WSS
138	DI	SS-01-40-1	No. 2 Water Pumps in AUTO	AUTO	-	01-40	WSS
139	DI	SS-01-40-2	No. 2 Water Pump #1 LEAD	LEAD	-	01-40	WSS
140	DI	PS-01-40-1	No.2 Water Pressure Switch Closed at 80PSI / Open at 89PSI		-	01-40	WSS
141	DI	PS-01-40-2	No.2 Water Pressure Switch Closed at 76PSI / Open at 85PSI		-	01-40	WSS
142	DI	PS-01-40-3	No.2 Water Pressure Switch Closed at 88PSI		-	01-40	WSS
143	DI	PS-01-40-4	No.2 Water Pressure Switch Closed at 84PSI		-	01-40	WSS

No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
144	DO	01P1-1	Main Lift Pump #1 On Command	ON	-	01-1	WSS
145	DO	01P1-1	Main Lift Pump #1 Off Command	OFF	-	01-1	WSS
146	DO	01P1-2	Main Lift Pump #2 On Command	ON	-	01-1	WSS
147	DO	01P1-2	Main Lift Pump #2 Off Command	OFF	-	01-1	WSS
148	DO	01P1-3	Main Lift Pump #3 On Command	ON	-	01-1	WSS
149	DO	01P1-3	Main Lift Pump #3 Off Command	OFF	-	01-1	WSS
150	DO	01P1-4	Main Lift Pump #4 On Command	ON	-	01-1	WSS
151	DO	01P1-4	Main Lift Pump #4 Off Command	OFF	-	01-1	WSS
152	DO	01P1-5	Main Lift Pump #5 On Command	ON	-	01-1	WSS
153	DO	01P1-5	Main Lift Pump #5 Off Command	OFF	-	01-1	WSS
154	DO	01P1-6	Main Lift Pump #6 On Command	ON	-	01-1	WSS
155	DO	01P1-6	Main Lift Pump #6 Off Command	OFF	-	01-1	WSS
156	DO	01P1-7	Main Lift Pump #7 On Command	ON	-	01-1	WSS
157	DO	01P1-7	Main Lift Pump #7 Off Command	OFF	-	01-1	WSS
158	DO	01M4	Grinder On Command	ON	-	01-4	WSS
159	DO	01M4	Grinder Off Command	OFF	-	01-4	WSS
160	DO	01M5-1	Bar Rack #1 Auto On Command	AUTO ON	-	01-5	WSS
161	DO	01M5-2	Bar Rack #2 Auto On Command	AUTO ON	-	01-5	WSS
162	DO	01G6-1	East Upstream Head Gate Open Command	OPEN	-	01-6	WST
163	DO	01G6-1	East Upstream Head Gate Close Command	CLOSE	-	01-6	WST
164	DO	01G6-1	East Upstream Head Gate Stop Command	STOP	-	01-6	WST
165	DO	ZAS-01-6-1	East Upstream Head Gate Interlock Failure	Interlock Failure	-	01-6	WSS
166	DO	01G6-2	West Upstream Head Gate Open Command	OPEN	-	01-6	WST
167	DO	01G6-2	West Upstream Head Gate Close Command	CLOSE	-	01-6	WST
168	DO	01G6-2	West Upstream Head Gate Stop Command	STOP	-	01-6	WST
169	DO	ZAS-01-6-2	West Upstream Head Gate Interlock Failure	Interlock Failure	-	01-6	WST
170	DO	01G7	Inlet Crossover Gate Open Command	OPEN	-	01-7	WSS
171	DO	01G7	Inlet Crossover Gate Close Command	CLOSE	-	01-7	WSS
172	DO	01G7	Inlet Crossover Gate Stop Command	STOP	-	01-7	WSS
173	DO	01G8-1	East Downstream Head Gate Open Command	OPEN	-	01-8	WSS
174	DO	01G8-1	East Downstream Head Gate Close Command	CLOSE	-	01-8	WSS
175	DO	01G8-1	East Downstream Head Gate Stop Command	STOP	-	01-8	WSS

No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
176	DO	ZAS-01-8-1	East Downstream Head Gate Interlock Failure	Interlock Failure	-	01-8	WSS
177	DO	01G8-2	West Downstream Head Gate Open Command	OPEN	-	01-8	WSS
178	DO	01G8-2	West Downstream Head Gate Close Command	CLOSE	-	01-8	WSS
179	DO	01G8-2	West Downstream Head Gate Stop Command	STOP	-	01-8	WSS
180	DO	ZAS-01-8-2	West Downstream Head Gate Interlock Failure	Interlock Failure	-	01-8	WSS
181	DO	01V11-1	Lincoln Wesr Box Valve #1 Open Command	OPEN	-	01-11	WST
182	DO	01V11-1	Lincoln West Box Valve #1 Close Command	CLOSE	-	01-11	WST
183	DO	01V11-1	Lincoln West Box Valve #1 Stop Command	STOP	-	01-11	WST
184	DO	01V11-2	Lincoln West Box Valve #2 Open Command	OPEN	-	01-11	WST
185	DO	01V11-2	Lincoln West Box Valve #2 Close Command	CLOSE	-	01-11	WST
186	DO	01V11-2	Lincoln West Box Valve #2 Stop Command	STOP	-	01-11	WST
187	DO	01V11-3	Lincoln West Box Valve #3 Open Command	OPEN	-	01-11	WST
188	DO	01V11-3	Lincoln West Box Valve #3 Close Command	CLOSE	-	01-11	WST
189	DO	01V11-3	Lincoln West Box Valve #3 Stop Command	STOP	-	01-11	WST
190	DO	01V11-4	Lincoln West Box Valve #4 Open Command	OPEN	-	01-11	WST
191	DO	01V11-4	Lincoln West Box Valve #4 Close Command	CLOSE	-	01-11	WST
192	DO	01V11-4	Lincoln West Box Valve #4 Stop Command	STOP	-	01-11	WST
193	DO	01V11-5	East Sump Discharge Valve Open Command	OPEN	-	01-11	WSS
194	DO	01V11-5	East Sump Discharge Valve Close Command	CLOSE	-	01-11	WSS
195	DO	01V11-5	East Sump Discharge Valve Stop Command	STOP	-	01-11	WSS
196	DO	ZAS-01-11-5	East Sump Discharge Valve Interlock Failure	Interlock Failure	-	01-11	WSS
197	DO	01V11-6	54" SWOO Discharge Valve Open Command	OPEN	-	01-11	WSS
198	DO	01V11-6	54" SWOO Discharge Valve Close Command	CLOSE	-	01-11	WSS
199	DO	01V11-6	54" SWOO Discharge Valve Stop Command	STOP	-	01-11	WSS
200	DO	ZAS-01-11-6	54" SWOO Discharge Valve Interlock Failure	Interlock Failure	-	01-11	WSS
201	DO	01V11-7	Discharge Crossover Valve Open Command	OPEN	-	01-11	WSS
202	DO	01V11-7	Discharge Crossover Valve Close Command	CLOSE	-	01-11	WSS
203	DO	01V11-7	Discharge Crossover Valve Stop Command	STOP	-	01-11	WSS
204	DO	ZAS-01-11-7	Discharge Crossover Valve Interlock Failure	Interlock Failure	-	01-11	WSS
205	DO	01V11-8	42" RSP Discharge Valve Open Command	OPEN	-	01-11	WSS
206	DO	01V11-8	42" RSP Discharge Valve Close Command	CLOSE	-	01-11	WSS
207	DO	01V11-8	42" RSP Discharge Valve Stop Command	STOP	-	01-11	WSS

No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
208	DO	ZAS-01-11-8	42" RSP Discharge Valve Interlock Failure	Interlock Failure	-	01-11	WSS
209	DO	01V11-9	48" OWPCP Discharge Valve Open Command	OPEN	-	01-11	WSS
210	DO	01V11-9	48" OWPCP Discharge Valve Close Command	CLOSE	-	01-11	WSS
211	DO	01V11-9	48" OWPCP Discharge Valve Stop Command	STOP	-	01-11	WSS
212	DO	ZAS-01-11-9	48" OWPCP Discharge Valve Interlock Failure	Interlock Failure	-	01-11	WSS
213	DO	LAHH-01-13-1	Lincoln West Box Overflow Alarm	OVERFLOW	-	01-13	WSS
214	DO	LAHH-01-15-1	Vicente West Box Overflow Alarm	OVERFLOW	-	01-15	WSS
215	DO	01SD18-1	WSS Decant Sampler	SAMPLE	-	01-18	WSS
216	DO	01SD18-2	WSS Overflow Sampler	SAMPLE	-	01-18	WSS
217	DO	01V19-1	Lincoln West Box Flushing Valve Open Command	OPEN	-	01-19	WST
218	DO	01V19-1	Lincoln West Box Flushing Valve Close Command	CLOSE	-	01-19	WST
219	DO	SS-01-19-2-3	Vicente West Box Flushing Valve Remote Mode	REMOTE	-	01-19	WST
220	DO	01V19-2	Vicente West Box Flushing Valve Open Command	OPEN	-	01-19	WST
221	DO	01V19-2	Vicente West Box Flushing Valve Close Command	CLOSE	-	01-19	WST
222	DO	01SD28	SWOO Junction Box Sampler	SAMPLE	-	01-28	WSS
223	DO	QS-01-31-1	WSS Operational Mode 1	MODE 1	-	01-31	WSS
224	DO	QS-01-31-2	WSS Operational Mode 2	MODE 2	-	01-31	WSS
225	DO	QS-01-31-3	WSS Operational Mode 3	MODE 3	-	01-31	WSS
226	DO	QS-01-31-4	WSS Operational Mode 4	MODE 4	-	01-31	WSS
227	DO	QS-01-31-5	WSS Operational Mode 5	MODE 5	-	01-31	WSS
220	DO	FIHK-01-32	Maximum Westside Flow Signal	MAXIMUM	-	01-32	WSS
221	DO	01P40-1	No. 2 Water Pump #1 AUTO ON Operation	AUTO ON	-	01-40	WSS
222	DO	01P40-2	No. 2 Water Pump #2 AUTO ON Operation	AUTO ON	-	01-40	WSS

No.	Type	Tag #	Description	Active State	Range	Loop No.	Location
Lake Merced Facilities Input/Output Point							
223	DI	01P60-1	Hypochlorite feed line solenoid valve Open Limit Switch	OPEN	-	01-60	LMT
224	DI	01P60-1	Hypochlorite feed line solenoid valve Close Limit Switch	CLOSE	-	01-60	LMT
225	DI	01P60-1	Hypochlorite feed line solenoid valve Remote Mode	REMOTE	-	01-60	LMT
226	DO	01P60-1	Hypochlorite feed line solenoid valve Open Command	OPEN	-	01-60	LMT
227	DO	01P60-1	Hypochlorite feed line solenoid valve Close Command	CLOSE	-	01-60	LMT
228	DO	01P60-1	Hypochlorite feed line solenoid valve Interlock Failure	Interlock Failure	-	01-60	LMT
229	DI	01P60-2	LMT sampling station solenoid valve Open Limit Switch	OPEN	-	01-60	LMT
230	DI	01P60-2	LMT sampling station solenoid valve Close Limit Switch	CLOSE	-	01-60	LMT
231	DI	01P60-2	LMT sampling station solenoid valve Remote Mode	REMOTE	-	01-60	LMT
232	DO	01P60-2	LMT sampling station solenoid valve Open Command	OPEN	-	01-60	LMT
233	DO	01P60-2	LMT sampling station solenoid valve Close Command	CLOSE	-	01-60	LMT
234	DO	01P60-2	LMT sampling station solenoid valve Interlock Failure	Interlock failure		01-60	LMT
235	DI	LAHH-01-60-1	Overflow signal #1	Overflow	-	01-60	LMT
236	DI	LAHH-01-60-2	Overflow Signal #2	Overflow	-	01-60	LMT
237	DI		Additional remote terminal unit point	Spare	-	01-60	LMT
238	DI		Additional remote terminal unit point	Spare	-	01-60	LMT
239	DO		Additional remote terminal unit point	Spare	-	01-60	LMT
240	DO		Additional remote terminal unit point	Spare	-	01-60	LMT